TOMORROW'S Papermaking Skill: Expert Summaries of the Paper Machine Fundamentals Symposium TODAY'S Forestry Practice: Full Field Report of the Executives' Tour of Maine Woodlands

PAPER TRADE JOURNAL

OCTOBER 1, 1954

WOOD PULP

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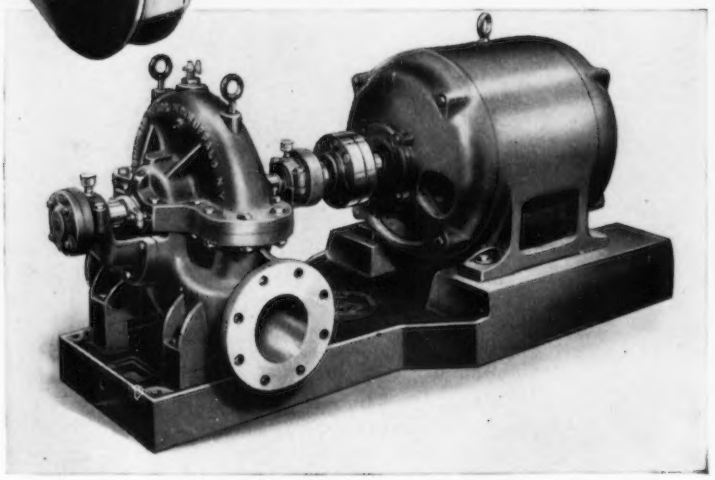

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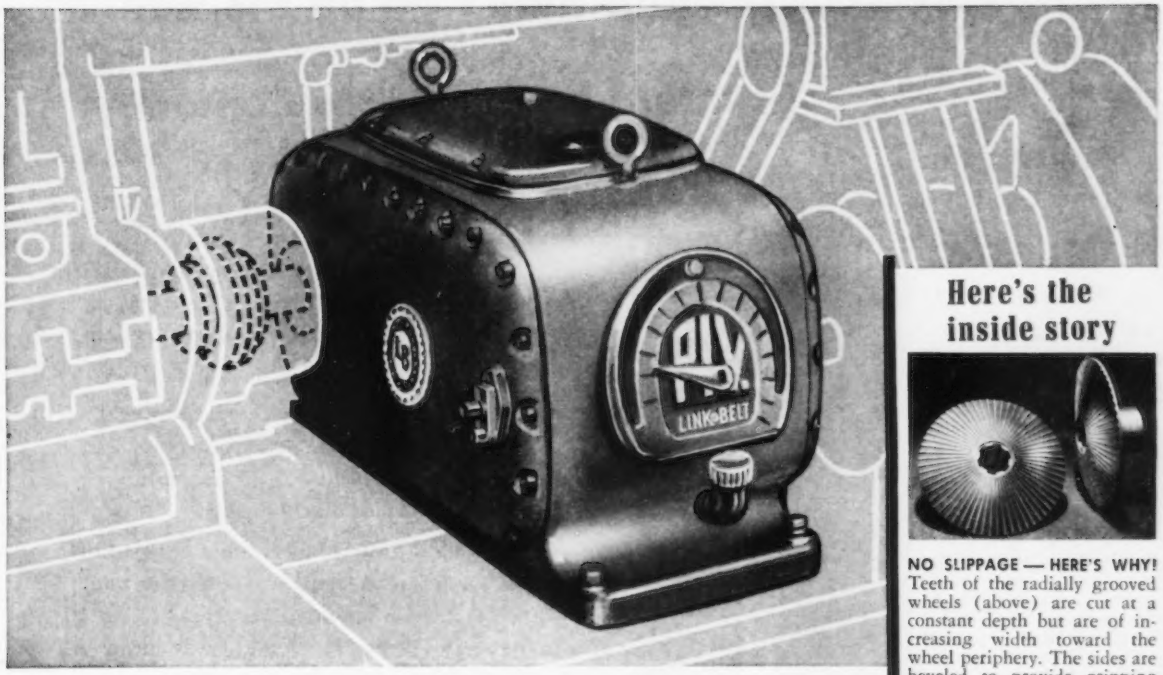

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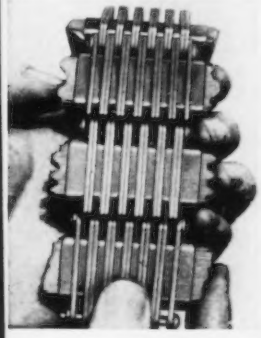

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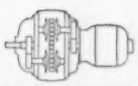
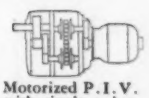


Motorized P.I.V. with single reduction input and output helical gears.



Motorized P.I.V. with single reduction input and double reduction output helical gears.

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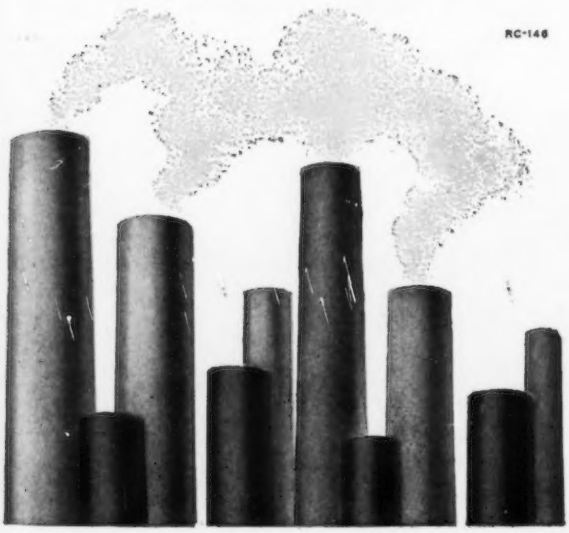

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REMEMBER THESE DATES

OCT. 18-21: TAPPI Engineering Conference, Benjamin Franklin Hotel, Philadelphia, Pa.

OCT. 18-22: 42nd National Safety Congress and Exposition, Conrad Hilton, Congress, Morrison and La Salle Hotels, Chicago, Ill.

NOV. 8-9: TAPPI Fibrous Agricultural Residues Conference, National Regional Research Laboratory, Peoria, Ill.

NOV. 17-19: TAPPI Corrugated Containers Conference, General Ogelthorpe Hotel, Savannah, Ga.

FEB. 20-25: APPA Annual Meeting, Waldorf-Astoria Hotel, New York, N. Y.

FEB. 21-24: TAPPI Annual Meeting, Commodore Hotel, New York, N. Y.

MAY 18-21: Third Western International Meeting of the Pulp and Paper Industry, Empress Hotel, Victoria, B. C.

PAPER TRADE JOURNAL

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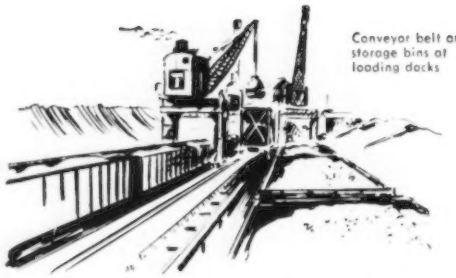

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PAPER TRADE JOURNAL

TRENDS

Early Fall Business Inching Ahead

Production levels of U. S. paper and paperboard mills are inching up to the customary October peak. It appears, however, they will level at 4 to 5 percent under 1953's highs.

Ratio of U. S. paper production to mill capacity for the week ended September 18 was reported by the American Paper and Pulp Assn. at 93.2 percent, compared with 91.9 for September 4 — the last full week before the long Labor Day holiday — and with 97.2 in the 1953 week. Paperboard output for the same week was 93 percent, compared against 91 for September 4 week and with 100 percent a year ago.

Normal Seasonal Pickup In Progress, Says NAPA

In the opinion of the National Assn. of Purchasing Agents, a normal seasonal pickup appears to be in progress. "No quick spurt is expected," said the September report of the purchasing group, "but a gradual, steady increase in activity in a highly competitive buyer's market."

Continued business improvement over the remainder of the year was cautiously forecast.

Conservative Buying Policy. Also noted by NAPA was that business continues to operate conservatively with its buying policy at 60 days for the most part. Industrial inventories are lower and more stable, the report stated, and there is a marked tendency to keep them at working levels. Confidence in the price structure, satisfactory delivery schedules, plus high warehousing costs encourage this policy.

Inventories At Seasonal Minimum. From all reports, stocks of wood pulps, waste paper, paper and paperboard products, apparel, accessories, etc., are all at a seasonal minimum. Because of uncertain business prospects, buying is cautious and to immediate needs levels. Thus, a sudden rally, such as that which now has the garment industry working at fever pitch, would be felt by most industries.

Wholesale Buying Gains. Increased orders for apparel, cotton textiles, and some household goods were reported by Dun and Bradstreet for the latest week — ended September 24. September retail trade has been better than expected, and more merchants are optimistically loosening their purse strings. They found, however, that manufacturers' predictions of a few weeks ago — that delayed deliveries would result from the shallow early buying—are being fulfilled.

Look for Moderate Upturn in Industrial Activity

A moderate upturn in manufacturing in November and December is looked for by D&B. Until then, the current rate of production at 10 percent below 1953 is expected to continue.

FRB Index Steady At 124. Indices of industrial activity show no advance over the 124 percent level reported for May and June. The Federal Reserve Board reported 124 for July and August, and the *New York Times* index of business activity for September's three weeks is slightly below the August figure, pulled down by freight carloadings, steel and lumber production. With seven of the 18 automobile companies closed for model changeovers, the 45 percent cut in automobile output in the latest week effected similar losses in steel manufacture and freight carloadings.

Paperboard Men Plan for Accelerated Demand

Paperboard men on the whole look for business demand to accelerate during the remaining months of the year. With inventories at a low of normal, they expect brisk buying and healthy competition to be maintained. Even the most optimistic do not see paperboard output this Fall at the peak levels of 1953, however.

New Order Gains. It is noteworthy that the volume of new orders is comparable with year-ago levels. For the week ended September 18—see accompanying table —the total was but 1,022 tons behind the year ago week. And during the past eight weeks, new orders for boards have exceeded the 1953 weeks on four occasions.

That backlogs are appreciably lower is in part due to the lighter demand for container boards from the automotive and associated industries. New southern container board capacity is not running full, and output of liners and corrugating medium during the shorter vacation month of July was down 32,000 tons from the year-ago month, and 70,000 tons less in June than the 1953 record.

Minor Revisions In Contract Pulp Prices

Viewing the U. S. wood pulp market as a whole, contract levels will be unchanged for the fourth quarter, 1954. U. S. and Canadian grades show no change from third-quarter levels. In Scandinavian pulps, only minor revisions have been reported.

With the sole exception of a $5 cut in the price of a U. S. semi-bleached kraft, U. S. and Canadian prices are at the earlier range of $140 for bleached sulphites, $140 for bleached hardwood kraft, $142.50 west coast bleached kraft, $145/147.50 other bleached krafts; $95/105 unbleached southern krafts, U.S., $105/135 unbleached krafts, Canadian; $120 unbleached sulphites, U. S. and Canadian, all freight allowed basis.

For the Scandinavian grades, Norwegian agents indicate no price change. Semi-bleached kraft of Finnish origin is $2.50 per ton higher at the range of $132.50/137.50.

The Swedish revisions chiefly bring the low of the range grade by grade to the going level—to $142.50 on dock for bleached krafts, for example—and wipe out concessions. Two bleached hardwood krafts are lifted $2.50 to $130 on dock. Bleached sulphites are unchanged within the range of $135/137.50 on dock to $140/145 with limited freight allowances. Semi-bleached krafts range from $130/135, and represent a $2.50 advance for one brand; unbleached krafts are unchanged at $105/110 freight allowed.

The wanted rises in Swedish unbleached sulphites encountered U. S. dealer resistance, net result of which is some subtle shadings in freight allowances. In one instance a $4 lift is indicated, in another $2, in others "minor adjustments" are reported. Prices range from $114 on dock to $125 with varying freight allowances.

Casein Price Dips As IAPI Cuts Minimum Export Price

Restrained consumer buying and the prospect of abundant supplies of Argentine casein from the new season's production last week induced that government's organization IAPI to cut the minimum export price by more than 2c to a 19 cent level. New replacement prices are now 22½/23 cents duty paid New York.

Marked increase in soybean protein usage and lack of demand for casein are noted by all dealers here. Looked for is a more stable marketing policy for the Argentine product to stimulate consumer buying here. —E.P.N.

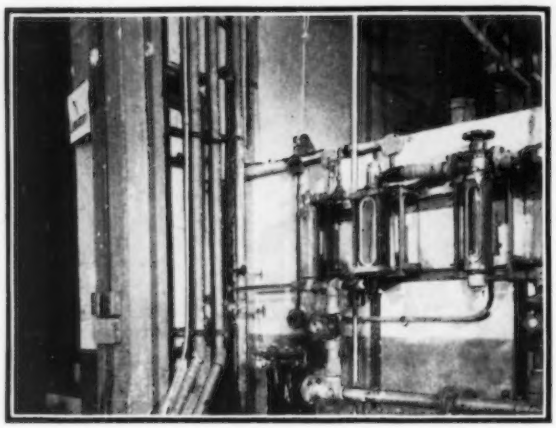
Paperboard Production (Tons)*

	Sept. 18 1954	Sept. 11 1954	Sept. 19 1953
Production ...	244,607	176,765	264,379
New Orders ...	235,147	200,184	236,169
Unfilled Orders .	408,830	419,109	523,839
% of Activity..	93	70	100

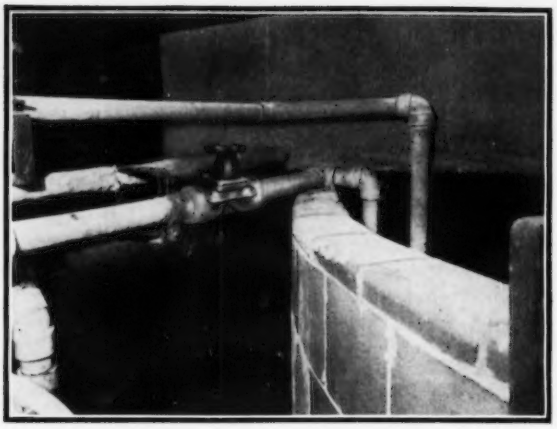
*Source: National Paperboard Assn.

Paper mill licks corrosion problems with U. S. Uscolite plastic

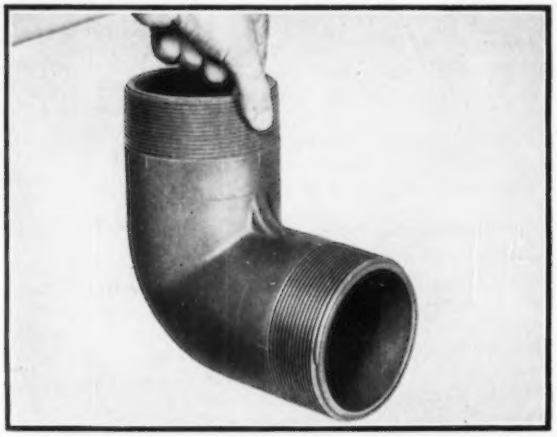
Section of U. S. Uscolite plastic piping forming a manifold carrying highly corrosive alum from storage tanks. Here the alum line is broken up to carry it to several paper machines. Uscolite shows no sign of corrosion, after 2 years' service.



Uscolite piping and flanges on the lower bleach line. Two interchangeable pumps draw the bleach liquor from the bottom of the storage tank to the paper machines. The bleach liquor corrodes the insides of metal pipe—and the fumes, the outside. Uscolite pipe shows no signs of corrosion after 2 years of wear.



Uscolite piping taking bleach liquor from the storage tanks —via the upper bleach liquor line. Here the Uscolite pipe replaced metal pipe and rubber-lined pipe. Bleach liquor must be fed at an even rate. Unlike metal pipe, Uscolite piping does not build up internal deposits, and thus permits steady flow and control at all times.



Uscolite pipe and fittings are made in broadest and largest line of stock sizes on the market. Sizes run from ½" to 6".

Uscolite® plastic piping, fittings, flanges, deflectors, valves and fume ducts will handle any chemical used in paper mills, including alum, bleaches, brines, and chlorine. A product of United States Rubber Company, Uscolite is extremely light in weight, yet has very high impact strength. It is threaded and assembled with ordinary piping tools—*without* special preparation. Immediate delivery of standard sizes of pipe and fittings. The Uscolite Hills-McCanna valve is also available. Get in touch with any of our selected distributors or any of the 27 "U. S." District Sales Offices or write to address below.

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Gilbert Expands Paper Production

Gilbert Paper Co. of Menasha, Wis. has just had its largest machine rebuilt and enlarged in order to increase production and improve quality. This is the largest paper machine in a purely rag content paper mill. The machine, which was rebuilt by the original manufacturers, Rice, Barton and Fales, has the first Rice, Barton differential drive.

The wet end of the machine has been completely rebuilt with all fourdrinier parts except the cable rolls and the headbox fabricated of Monel. The wire has been lengthened from 50 to 75 feet, with a new and larger Beloit suction couch. A variable speed dandy roll drive of Gilbert's own design and manufacture has been installed.

A second Bird screen has been added as well as a battery of Dirtecs.

Ten paper dryers and four feet dryers have been added as well as a backtender (Carrier) rope system.

The new Pope reel is the first to be used on rag content papermachines. The hydraulic oil gear drive on the winder is also another innovation.

The machine is of course equipped with Gilbert and Nash wire and felt guides. The Gilbert Paper Co. owns a controlling interest in Gilbert and Nash.

The machine has been rebuilt to operate at a maximum speed of 600 f.p.m. This will give a 30 percent increase in production which necessitates rebuilding to air drying room to accommodate an extension to the air drying machine. The renovation of the machine, addition of the new drive, etc., was all accomplished in two weeks and four days.

Two Covington Men Suffocate in Steam

Two veteran employes of the West Virginia Pulp and Paper Co., Covington, Va., were killed and a third received slight burns today when steam poured from a bursting 30-pound line.

The dead men were identified as Lonnie Myers, 69, and Emory R. Jones, 63. They were working on top of a pulp storage tank underneath the building's roof and were quickly suffocated by the rising steam.

NEW OPERATORS OF OLD PEARL CITY MILL — Lawrence Sochia and Mrs. Sochia (left) of Watertown, N. Y., and Atty. Samuel Sklar of New York City have taken charge of reopening the former Pearl City division of American Tissue Mills, South Hadley, Mass. As general manager, Mr. Sochia will team up with his wife in hiring workers and directing operations. Mr. Sklar is in charge of finances and secretary of the new South Hadley Paper Mills Corp., which purchased the mill from Aaron Krok.

Harrisville Mill May Reopen

A program for liquidation of the indebtedness of the Harrisville Paper Corp. is now under way, and the mill may reopen eventually, a New York attorney disclosed to correspondents of the *Watertown Daily Times*.

Attorney Morton G. Rosenberg of 230 Park avenue said creditors were being paid off "100 cents on the dollar" and the prospect was good that operations would resume. He declined, however, to indicate a date.

Mr. Rosenberg is attorney for George E. Bass of Jackson, Miss., the largest individual stockholder. The Harrisville mill was purchased by the G. E. Bass Co. of Jackson in November, 1953, from the St. Regis Paper Co., who still holds a minority interest in the mill.

The attorney confirmed that Jack Arnold, who had been identified with the Harrisville Paper Corp. and at one time with the Dexter Pulp, Sulphite & Paper Co., now defunct, and also with the bankrupt Paper Corp. of America, Cheboygan, Mich., was definitely out of the Harrisville picture.

Mills Win Support For Wisconsin Reservoir

The Heart of Wisconsin Conservation League has conditionally approved creation of the proposed George Mead Reservoir on the Little Eau Pleine River.

The Wisconsin Valley Improvement Co., owned by paper mills along the Wisconsin River, has asked the State Public Service Commission for authority to construct the 27,000 acre reservoir, to supply a steady water level along the river.

The conservation league voted to support the project, located in its membership area, under condition that the paper mill owned firm would guarantee in writing to maintain a minimum water level arrived at by the State Public Service Commission, the Wisconsin Conservation Department and the company, and would also guarantee to build an adequate number of roads to the flowage and to open the entire area to hunting and fishing.

Other conservation groups in the state have consistently opposed the reservoir on grounds that it would be injurious to wild life in the area.

CAMAS MILL REDUCES TIME 99.6% for calculating payroll. By hand, all the required computations took nearly 200 hours of steady figuring. With new IBM calculator, the job is done in 53 minutes. Dept Supervisor at this Crown Zellerbach mill is Keith Olsen, right, who demonstrates the electronic device to C. Zimmerman (left) and B. Smith.

With equal ease, the machine tells how many board feet of logs have been cut in all Crown Zellerbach logging operations, when a tree should be cut for maximum results, gives a complete inventory of all items in the mill and, with supplementary machines, turns out the pay checks for the St. Helens and West Linn divisions as well as for Camas.

Victoria Paper Mills Will Liquidate Assets

Following the earlier reported appeal for debt relief, Victoria Paper Mills, Fulton, N. Y., now declares that it will discontinue operations permanently, liquidate its assets and pay all creditors in full. Joel S. Hartman has announced that the creditors have been informed of the action.

Victoria is a two-machine tissue mill that employed about 185 workers until it ceased production this month. Its production has averaged 70,000 pounds per day. The company filed petition on September 14 under Chapter 11 of the Bankruptcy Law in U. S. District Court at Utica, N. Y. No receiver is appointed under this section.

K-C to Erect New General Offices

Plans for expansion of its Research and Development Department were coupled with the Kimberly-Clark Corp., announcement that it will build new general offices on company owned land adjacent to its Lakeview Mill on Little Lake Butte des Morts. The 50-acre tract lies north of the mill site in Menasha, Wis. The new structure will replace the 82 year old present building in downtown Neenah which will be used for expanded research and development.

Bids for the new general offices will be let early next spring and construction is expected to be completed by the spring of 1956. Approximately 550 headquarters personnel will be relocated in the new buildings which will be in two units with a combined floor space of about 100,000 sq. ft. The north building will be a 2-story structure to house general management offices and those departments which are called upon by outside organizations.

The south building will be one-story. Both units will be similar in design and construction and of steel and glass with pre-cast marble-ized panels. Radiant heating, air conditioning and fluorescent lighting are among special features of the construction; along with plans that permit extreme flexibility and future expansion.

Steam and water for the new units will be supplied from the Lakeview Mill. A separate sewage disposal unit will be built.

Strathmore Buys Factory To Use As A Warehouse

F. Nelson Bridgham, president of the Strathmore Paper Co., West Springfield, Mass., has revealed that his company has purchased the property of the W. Warren Thread Works, Inc., Westfield, Mass.

The new acquisition will be used as a central warehouse and shipping point for the papers manufactured at the company's mills in West Springfield, its two mills in Woronoco, and its Keith Paper Co. division in Turners Falls.

Only the physical assets of the Westfield textile firm were involved.

Sweden Discontinues Newsprint Exports to U. S.

According to an item in *Svenska Dagbladet*, Stockholm, Sweden, September 3, 1954 the only Swedish paper mill, Holmens Bruk, which continued large-scale exports of newsprint to the United States after the war, has decided to cease such exports. The resulting loss of dollar revenue for Sweden will be about $1.45 million per year, and Swedish shipping to the United States also will be affected. The reasons for the decision are the steadily decreasing profitability of exports to the United States and the increasing Swedish paper consumption, which necessitates cutting down the least remunerative exports.

After the war Holmens Bruk, in contrast to the other Swedish newsprint exporters, tried consistently to defend its old position in the U.S. market, and from the start it followed a price policy agreeable to U.S. customers. Exports amounted at one time to about 30,000 tons annually, but then decreased to about 20,000 tons, and lately they have been only about 12,000 tons annually. The last deliveries will be made this year.

Rayonier Wins Rail Line Suit

The Rayonier Corp.'s plant near Jesup, Ga. won a court battle in which the plant location was a factor on September 24.

U.S. Judge Frank M. Scarlett ruled against the Atlantic Coast Line Railroad which has sought an injunction to bar the Southern Railway from serving the 25-million-dollar plant directly.

Rayonier joined in the defense, contending that its competitive position would be injured if it were not served by both lines. It estimated 30 percent of wood pulp it will buy for raw materials will come from Southern Railway points.

ACL argued that the plant actually is located at Doctortown, on the Altamaha River, which is an ACL local station, and Southern must have ICC approval to serve it.

However, Judge Scarlett ruled that the plant was not located on the right of way of either railroad.

The plant built spurs to lines, three quarters of a mile to ACL and four and a half miles to Southern. As long as Southern serves only Rayonier on the spur, ICC approval is not necessary as the railroad is not extending its public territory, Scarlett ruled.

Rayonier contended that it would have to pay two-carrier rates if ACL brought in materials originating on Southern's track or else operate an expensive switch engine of its own.

Rocky River Receives Waste Control Award

An award plaque was given to the Rocky River Paper Mill, Inc., for their outstanding contribution to the clean water campaign in Mich.

Bulkley, Dunton Processes filtering equipment was installed to effect this pollution reduction. Of particular importance is the current fibre loss which measures forty-one pounds per day equivalent to 0.054 percent of production. This is well below the 1 percent limit that is required by the Water Resources Commission of Michigan. Rocky River Paper Mill, Inc. now ranks near the top among paper mills of the state in waste control performance.

Continental Can Purchase Of American Paper Goods Approved by Directors

Sale of the American Paper Goods Co., of Kensington, Conn., to Continental Can Co. has been approved by the directors of the two companies, it was announced September 20 by General Lucius D. Clay, chairman of the board of Continental, and Albert S. Redway, president of American Paper Goods.

Confirmation of the transaction is subject to ratification by American Paper Goods' stockholders.

American Paper Goods, with two plants located in Kensington and Chicago, is a manufacturer of paper cups, envelopes and bags.

"It is not anticipated that there will be any changes in plant locations," General Clay said. "Continental will operate this business as a supplement to its paper container division."

To Discuss Developmental Problems of Pulp and Paper Industry in Latin America

A group of North American experts in pulp and paper industry development will be among the technical advisors who will meet in Buenos Aires, Argentina, from October 18 to November 2, to discuss problems dealing with the development of the pulp and paper industry in Latin America.

The Economic Commission for Latin America, the Food and Agricultural Organization and the Technical Assistance Administration of the United Nations are jointly organizing the Latin American Meeting of Experts to discuss problems dealing with the development of the Pulp and Paper Industry in Latin America.

W. O. Hisey, vice-president and member of the Board of Directors of The Sandy Hill Iron and Brass Works of Hudson Falls, N. Y., has accepted the invitation of the Conference Directors to become discussion leader for the section on the *Economic Aspects of Pulp and Paper Manufacture from Latin American Tropical and Sub-Tropical Hardwoods.*

Mr. Hisey first became identified with the work of the F.A.O. when he took an active part in a meeting of the Economic and Social Council of the United Nations in Rome, Italy, December 1952, where a study was made of the world-wide pulp and paper field by the Food and Agricultural Organization of the United Nations.

CONDUCTS SEMINAR IN ANDOVER — Dr. Otto Brauns (second from right), Swedish industrial scientist, discusses technical details of the papermaking industry with officials of the Emerson Manufacturing Co. division of John W. Bolton & Sons, Inc. Dr. Brauns is currently on a six-week tour of the United States industry. Shown with him at the special seminar held in Andover are, left to right: John W. Bolton, president; Samuel Crocker, Jr., sales manager; Dr. Brauns and Bruno E. Prevost, general manager.

W. O. Hisey

Celler Sounds Off Again

Removal of tariffs on all grades of paper would restore a balance in the paper industry by eliminating the incentive to confine higher grades of paper to this country, Rep. Celler (N.Y.) September 14 told American delegation which will take part in the 9th session of the General Agreement on Tariffs and Trade.

Rep. Celler said because newsprint can be shipped into the U. S. duty-free, American firms maintain Canadian subsidiaries devoted almost entirely to newsprint production. Meanwhile, U. S. facilities are devoted to other grades of paper which are protected by tariffs from foreign competition.

Paper and Board Production

According to the American Paper and Pulp Association, the ratio of United States paper production to mill capacity for the week ending Sept. 18, 1954, was 93.2 percent, compared with 73.4 percent revised, for the preceding week. The ratio was 97.2 percent for the corresponding week a year ago. Mills producing newsprint exclusively are not included.

The paperboard production ratio for the week ending Sept. 18, 1954 was 93 percent, compared with 70 percent for the preceding week, and 100 percent for the corresponding week last year.

(Detailed statistics on page 37.)

PAPER PEOPLE

G. L. Heath Promoted by Scott

Scott Paper Co. has named G. L. Heath to the staff of the vice-president in charge of production. He will be technical assistant, replacing J. W. Shimp who was recently appointed Fort Edward, N. Y., plant manager.

Mr. Heath joined Scott in 1937 at Chester, Pa. as a third hand in the paper mill. He has filled assignments in Technical Control, Service Shop, Purchasing, Legal and Mechanical Development departments. He was production manager at the Chester plant at the time of his appointment.

Three Executive Changes At Howard Smith

Three major changes in the executive direction of Howard Smith Paper Mills Ltd. and its subsidiary companies, Alliance Paper Mills Ltd. and Don Valley Paper Co. Ltd. were made last week.

D. S. Abbott has been elected president of Alliance Paper Mills Ltd. and its subsidiary Don Valley Paper Co. Ltd. Mr. Abbott was also appointed a director of Howard Smith Paper Mills Ltd. Mr. Abbott joined the staff of Howard Smith Paper Mills Ltd. in 1944, as manager of the plastics division, now The Arborite Co. Ltd., of which he was elected president in 1953. He will continue to hold this office in addition to his new duties.

George E. Wilson, formerly manager of Don Valley Paper and Georgetown divisions of Alliance Paper Mills Ltd., has been appointed manager of operations for Alliance Paper Mills Ltd. and Don Valley Paper Co. Ltd. Mr. Wilson joined the staff of Howard Smith Paper Mills at Cornwall in 1928, and following his return from military service in 1946, was appointed superintendent of the Don Valley Paper Co. Ltd.

W. H. Aird, sales manager of Howard Smith Paper Mills Ltd., has been elected a vice-president of the company. He will assume direction of paper sales of Howard Smith Paper Mills, Alliance Paper Mills and Don Valley Paper Co. Mr. Aird has been in the employ of Howard Smith Paper Mills for 36 years, most of the time in sales.

Roland Packard to Serve Pittsfield Area

Roland A. Packard, formerly associated with Smith Paper Co., Lee, Mass., will return shortly from the Far East to become the representative of the Pittsfield (Mass.) Industrial Development Co. in its search for new industry for the Pittsfield section of Berkshire County.

Presently, Mr. Packard is in Korea setting up paper mills under the auspices of the Mutual Security Agency. He has been doing similar work in Formosa and the Philippines.

Zonner Named Exec. V. P. Of Valentine Pulp & Paper

William A. Zonner, formerly Executive Vice-President of Bagley & Sewall, has been named Executive Vice-President and General Manager of the Valentine Pulp & Paper Co. Inc., Lockport, La.

F. E. Newton Named Mgr. By Robert Gair

Robert Gair Co., Inc., has appointed Frank E. Newton manager of its Pennsylvania Corrugated Box Division in Philadelphia, Pa.

Mr. Newton has been with the company 24 years. He started at Boston as an order clerk. He was sales manager at Gair's Boston Corrugated Box Division nine years and had recently been division manager at its Ohio Corrugated Box Division in Cleveland.

Mr. Newton will replace Harry J. McPhilliamy who will act as assistant division manager, performing such duties as his health will permit.

Goodwill to Manage Bucksport Mill

St. Regis Paper Co. announces that Frederic C. Goodwill will become resident manager of its Bucksport, Maine mill, effective October 1, upon the retirement at that time of the present manager, George D. Bearce, who will continue available in a consulting capacity.

Mr. Goodwill joined St. Regis in January, 1928, as a chemist at the company's Deferiet, N. Y., mill. He then served as chief chemist and technical director of the groundwood paper division. From October, 1948 to August, 1953, he was resident manager of the St. Regis paper mill at Kalamazoo, Mich. Both the Bucksport and Kalamazoo mills are part of the St. Regis Printing, Publication and Converting Paper Division. From August, 1953 to the present, Mr. Goodwill has been assistant to William R. Adams, vice-president in charge of manufacturing.

Mr. Goodwill is a member of the National Executive Committee of TAPPI and the Advisory Board of the Pulp and Paper School of Western Michigan College at Kalamazoo.

G. T. Lane Retires as Asst. Gen. Mgr. of Eastman's Kodak Park Works

A key figure in the development of modern photographic paper manufacturing at Eastman Kodak Co.'s Kodak Park Works has retired. He is Gerould T. Lane, an assistant general manager of the film, paper, and chemicals plant and a pioneer whose association with the paper industry goes back more than forty years.

"Gerry" Lane entered the paper business with the Rising Paper Co., Housatonic, Mass., where he served as assistant superintendent until 1918.

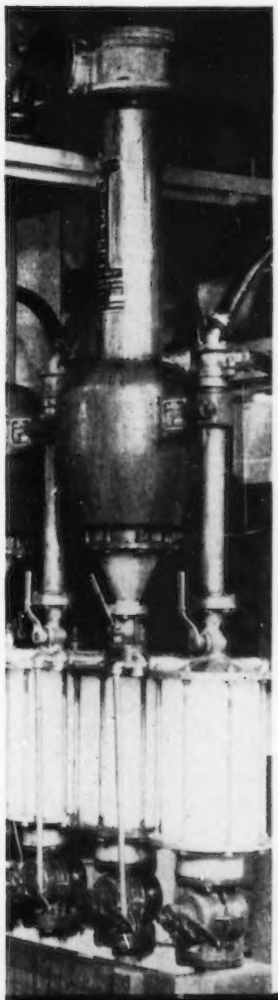
That year he went to Kodak Park where Kodak was just completing the construction of a full-scale paper mill based on earlier experimental work. Mr. Lane was to take charge. When the new mill went into operation in June, 1918,

(More People on page 37)

DIRTECS

REGULAR or **KING SIZE**

According To Your Dirt Removal Needs

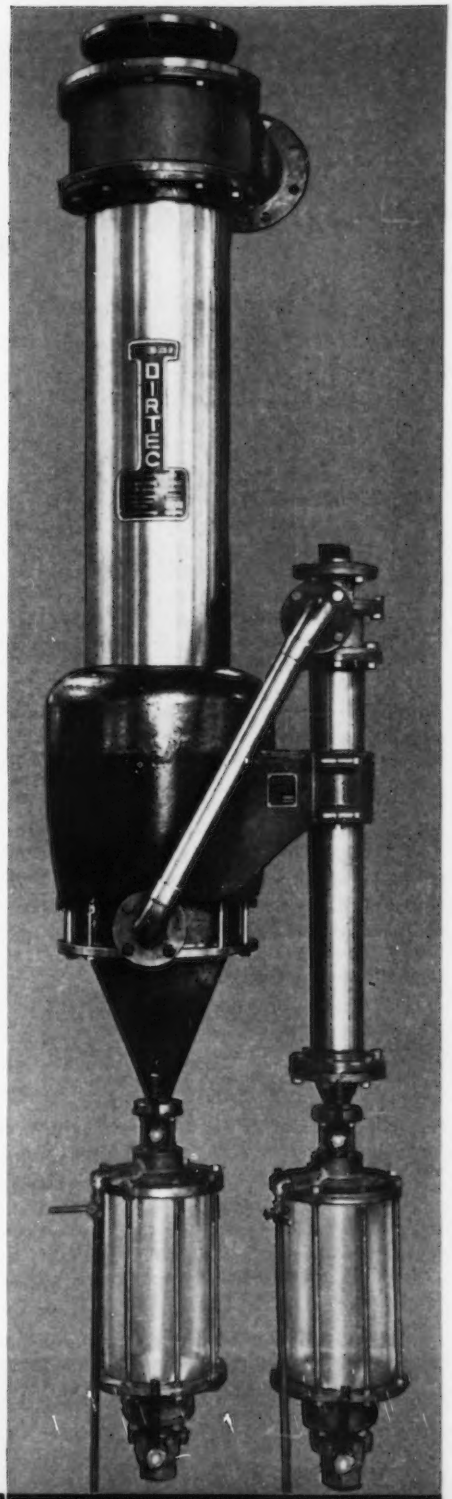


Whether you employ the 6″ or the 12″ Dirtec you can be sure of the extraordinary dirt removal efficiency that is inherent in Dirtec design.

Dirtecs deliver clean stock — none of it mixed with the rejects, which are removed from the pulp or papermaking system for good and all.

Dirtecs are exceedingly easy to install, operate and maintain. They are readily adaptable to *your* volume, *your* kinds of stock and the kinds of dirt *in* that stock.

May we make recommendations and estimates on the one best Dirtec set-up for you — regular or king size?



A single "King Size" Dirtec has a capacity of 1400 gallons per minute. In board mills these big Dirtecs may be equipped with continuous evacuators to handle large volumes of coarse heavy dirt.

BIRD MACHINE COMPANY
South Walpole • Massachusetts

Fundamentals of the Paper Machine

Outstanding authorities from all over the world discuss what makes paper machines tick.

An exceptional conference on the fundamentals of the paper machine was held at the Institute of Paper Chemistry September 20-24. This meeting, labeled a symposium, was sponsored by the Fundamental Research Committees of TAPPI and the Technical Section of C.P.P.A. In addition to the large attendance from the United States and Canada, there were a large number of experts present from other countries, including Norway, Sweden, Finland, Holland, Germany, Italy, England. The visiting experts took a leading part in the presentation of paper and the discussions.

Chairman of the TAPPI committee is Harry F. Lewis, research associate, Institute of Paper Chemistry, and the Canadian committee chairman is K. C. Logan, research director, Northeastern Paper Products, Quebec, P. Q.

The organization of, and facilities for, the meetings were carried on by the Institute of Paper Chemistry, with the smooth efficiency typical of the Institute.

Monday was devoted to a tour of the Institute of Paper Chemistry, together with conferences and committee meetings.

Tuesday

Chairman—Kenneth C. Logan.

Greetings, Westbrook Steele, president, The Institute of Paper Chemis ry.

Meeting objectives, Harry F. Lewis, Institute of Paper Chemistry chairman, Fundamental Research Committee, TAPPI.

"Flow in Fiber Suspensions and the Effects of Turbulence," J. A. Van den Akker, Institute of Paper Chemistry.

"Fiber Motions and Flocculation," S. G. Mason, Pulp and Paper Research Institute of Canada.

"Hydraulics of Flowbox and Slice," W. van der Meer, Van Gelder Zonen, N.V., Velsen, Holland.

"Model Experiments of Sheet Formation on the Cylinder Wire," Börje Steenberg, Jan Bergstrom, and R. I. Kjensjord, Swedish Forest Products Research Laboratory.

Panel Discussion and Question Period —The speakers, together with Joe Chapman, A. E. Reed & Co., Ltd.; H. W. Bennett, Kimberly-Clark Corp.; W. T. Bennett, Canadian International Paper Co.; J. Mardon, Northeastern Paper Products, Ltd.; and K. C. Logan, moderator.

Wednesday

Chairman — W. Boyd Campbell, Pulp and Paper Research Institute of Canada (retired) and charter member of the two Fundamental Research Committees.

"Filtration Resistance of Pulp Slurries," Roy P. Whitney and W. L. Ingmanson, Institute of Paper Chemistry.

"Quantitative Study of Water Removal by Table Rolls," W. E. Bennett, British Paper and Board Industry Research Assn.

"Influence of Differential Speeds between Stock and Wire on Sheet Properties," O. Andersson and J. Bergstrom, Swedish Forest Products Research Laboratory.

"Drainage Effects and Two-sidedness," George F. Underhay, Bowaters Development and Research Ltd.

"Laboratory Investigation of Water Removal by a Dynamic Suction Box," Lars Nordman, Central Laboratory of the Finnish Pulp and Paper Industries.

Panel Discussion and Question Period — The speakers, together with Peter Wrist, Quebec North Shore Paper Co.; C. A. Lee, Kimberly-Clark Corp.; C. A. Sankey, Ontario Paper Co., Ltd.; W. J. Foote, Consolidated Water Power & Paper Co.; P. S. Blickensderfer, Champion Paper and Fibre Co.; and W. Boyd Campbell, moderator.

Conference dinner, Riverview Country Club; toastmaster, Harry F. Lewis, Institute of Paper Chemistry.

Thursday

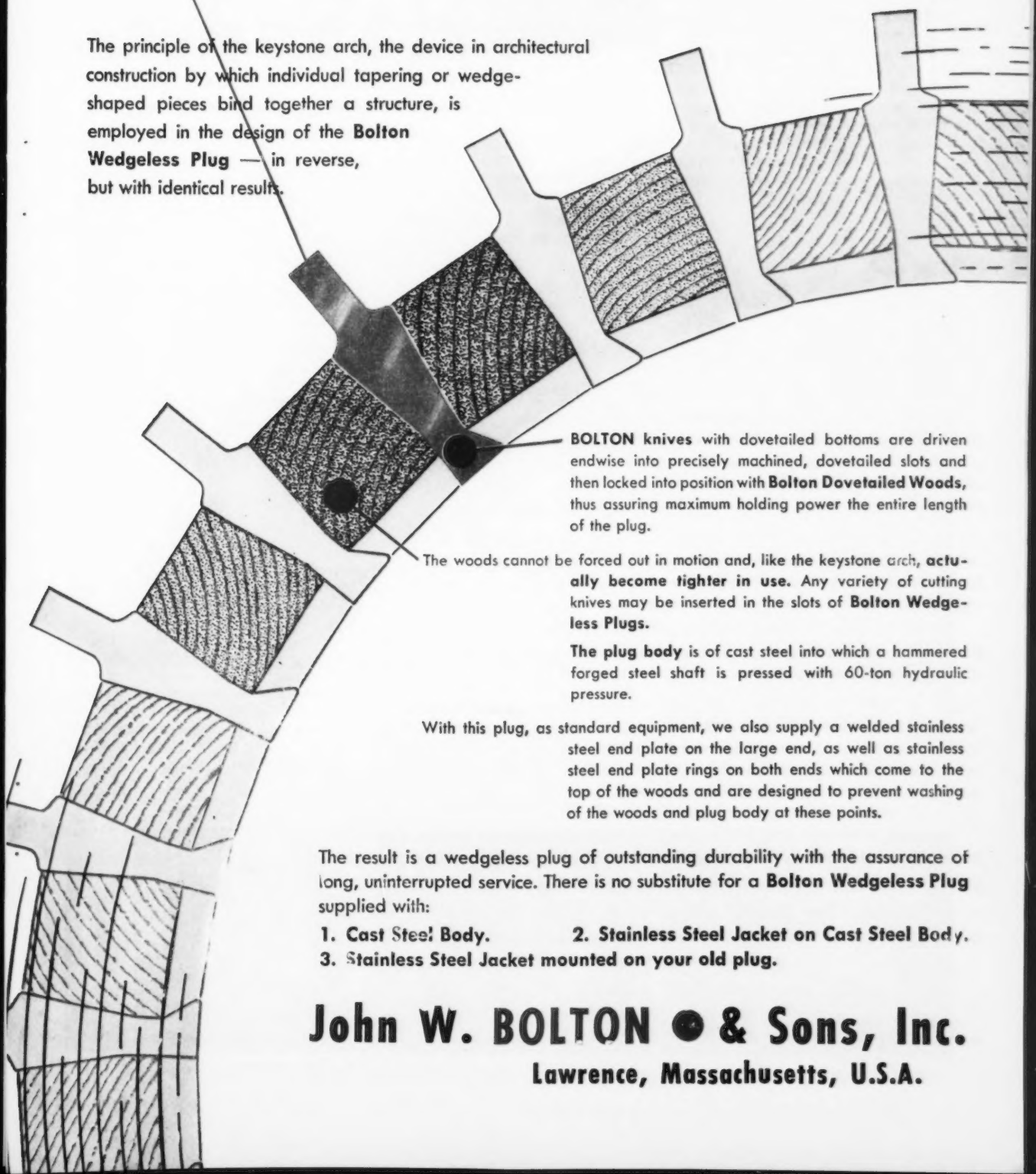
Chairman — Alfred J. Stamm, U. S. Forest Products Laboratory.

"Fibre Properties Involved in Adhesion and Cohesion with Reference to

(L to R) E. Manogue, R. Crawford, L. Wilder, W. Bennett, L. Nordman, G. Underhay, D. MacLaurin, W. Gallay, A. Nissan.

Knives are everlastingly locked in • BOLTON Wedgeless Plugs

The principle of the keystone arch, the device in architectural construction by which individual tapering or wedge-shaped pieces bind together a structure, is employed in the design of the **Bolton Wedgeless Plug** — in reverse, but with identical results.



BOLTON knives with dovetailed bottoms are driven endwise into precisely machined, dovetailed slots and then locked into position with **Bolton Dovetailed Woods**, thus assuring maximum holding power the entire length of the plug.

The woods cannot be forced out in motion and, like the keystone arch, **actually become tighter in use.** Any variety of cutting knives may be inserted in the slots of **Bolton Wedgeless Plugs.**

The plug body is of cast steel into which a hammered forged steel shaft is pressed with 60-ton hydraulic pressure.

With this plug, as standard equipment, we also supply a welded stainless steel end plate on the large end, as well as stainless steel end plate rings on both ends which come to the top of the woods and are designed to prevent washing of the woods and plug body at these points.

The result is a wedgeless plug of outstanding durability with the assurance of long, uninterrupted service. There is no substitute for a **Bolton Wedgeless Plug** supplied with:

1. Cast Steel Body. **2. Stainless Steel Jacket on Cast Steel Body.**
3. Stainless Steel Jacket mounted on your old plug.

John W. BOLTON • & Sons, Inc.

Lawrence, Massachusetts, U.S.A.

Wet Web Strength," Wilfred Gallay and L. M. Lyne, E. B. Eddy Co.

"The Functions of the Felt in Water Removal on the Papermaking Machine," Alfred H. Nissan, Professor of Wool Textile Engineering, Dept. of Textile Industries, The University, Leeds, England.

"The Effect of Wet Pressing on Sheet Properties," D. J. MacLaurin and J. F. Whalen, Institute of Paper Chemistry.

"The Evaluation of Paper Machine Stock Systems by Basis Weight Analysis," George Burkhard and Peter Wrist, Quebec North Shore Paper Co.

Panel Discussion and Question Period —The speakers and co-authors, together with W. Brecht, Institut für Papierfabrikation, Darmstadt, Germany; Fred B. Schelhorn, National Container Corp.; John C. Tongren, Hammermill Paper Co.; M. N. Davis, Kimberly-Clark Corp.; and A. J. Stamm, moderator.

Friday

Chairman — John C. Wollwage, Kimberly-Clark Corp.; Member, Fundamental Research Committee of TAPPI.

"Measurement of Paper Machine Draws and Speed Variation," Dalton L. Shinn, Crown Zellerbach Corp.

"Introduction of Stress into a Paper Sheet on Drying," Bertil Ivarsson (on leave of absence from the Swedish Forest Products Research Laboratory), The Beveridge Paper Co.

"Elastic Theory of Nip Stresses and Hysteresis Effect," Homer E. Malmstrom, Kimberly-Clark Corp., and John P. Nash, University of Illinois.

R. P. Whitney

H. Vardeman

S. G. Mason

Panel Discussion and Question Period — The speakers and co-authors, with C. R. Calkins, Riegel Paper Corp.; Otto Brauns, Central Laboratory of the Swedish Paper Mills; J. d'A. Clark, Changewood Corp.; R. N. Griesheimer, Mead Corp.; and John C. Wollwage, moderator.

In order that our readers might have an authoritative summary of the papers in as simple language as possible, we prevailed upon Dr. W. L. Ingmanson to brief the papers for you. Dr. Ingmanson is on the staff of the Institute of Paper Chemistry and co-author of one of the papers presented.

Flow in Fiber Suspensions and the Effects of Turbulence

J. A. Van den Akker

Oscar Andersson

J. A. Van den Akker

Because of the strong bearing of theory and observational phenomena of aero- and hydrodynamics on the flow of low-consistency fiber suspensions, the nature of the flow of fluids around bodies and through ducts was reviewed. Special attention was given to the way in which turbulence is generated in boundary layers and to the velocity distribution across a duct. The dependence of the "critical" Reynolds number on the nature of the system in which flow occurs was described. Reference was made to modern methods for characterizing and measuring turbulent motion. The probable effects of the presence of fiber on turbulence and of the effects of turbulence on fiber motion were discussed. Theory and numerical calculations were given to demonstrate that, in consideration of the motion of individual fibers, viscous forces strongly predominate over inertial forces.

(L to R) J. Nish, B. Steenberg, H. Bennett, H. Malmstrom, J. Mardon, W. van der Meer, D. Shinn, B. Ivarsson, H. F. Rance.

DOW

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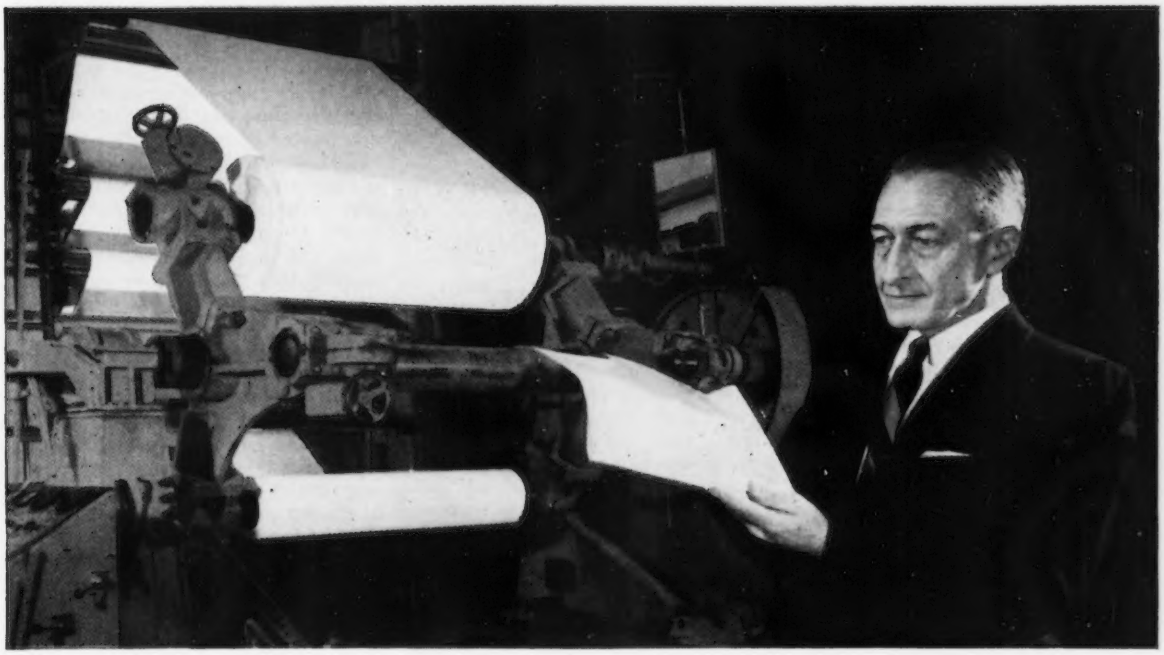
New Dow Latex 512-R offers better coating results at the super calender... provides greater formulation stability... wider choice of pigments and fillers



Developed expressly for the paper industry, Dow's new latex 512-R represents an improved formulation of the well-known Dow Latex 512-K. A film-forming material, Dow Latex 512-R provides more formulation versatility and permits greater freedom to adapt materials and methods to suit your equipment and requirements. The new latex gives you greater mechanical stability over a pH range of 3 to 10, increased compatibility with water dispersions such as starches and dextrins, and improved resistance to water soluble cations. In addition, laboratory and field tests show that latex 512-R has stronger binding power—particularly in starch coating colors. Paper coaters are discovering that Dow Latex 512-R enables them to produce finer gloss papers that yield better printing results with a brighter, fresher appearance. Whether you coat on or off—machine or at the size press, Dow Latex 512-R has benefits for you.

For further information regarding Dow 512-R applications, or to obtain your copy of "Dow Latex 512-R, An Improved Latex for Clay-Coated Paper," write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales, PL 495H-2.

CHEMICAL PROGRESS WEEK-MAY 17-23

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Fiber Motions and Flocculation

S. G. Mason

During flow through the headbox and slice and onto the wire of a paper machine, velocity gradients are established in the stock. Previous experimental work has shown that these velocity gradients are important in fiber flocculation. A summary was given of the results of an experimental study of the rotations and collisions of spheres, rigid cylinders, and wood fibers caused by velocity gradients in the liquids in which the particles are suspended. This work has been carried out to shed further light on the way in which fibers aggregate. The rotations, spins, and orbits of the model particles show good agreement with theoretical predictions. The motions executed by fibers are complicated by the bending which occurs and by their irregular shape.

The collisions of spheres have been studied in some detail. When two neutral spheres collide, a doublet which persists for a definite and predictable time is formed. This leads to a purely hydrodynamic association into doublets, triplets, etc. Collisions between cylinders are more difficult to characterize, but appear to involve collisions of orbits rather than actual contact. Collisions of fibers are still more complicated, but it has been shown that, on collision, two fibers can twist around one another and rotate as a doublet for a number of complete rotations; this is believed to be the first step involved in the flocculation of fibers in paper making stocks.

Model Experiments of Sheet Formation on the Cylinder Wire

Börje Steenberg, Jan Bergström, and R. I. Kjensjord

Model experiments, designed to simulate sheet formation on the wire of a cylinder machine, were carried out with an apparatus in which the sheet was continuously formed on a stationary wire from stock flowing past the wire at constant velocities. The rate of drainage as the sheet was formed was determined by the "making head" (the static pressure in the flowing stock plus the length of a siphon connected to the wire) and the pressure drop across the sheet formed. The drainage resistance of the pulp was found to be influenced by certain paper making variables as follows: (1) increasing velocity of stock relative to the wire gave increasing resistance; (2) increasing consistency of stock leads to decreasing resistance; and (3) increasing making head gave increasing resistance.

The model experiments were considered to have demonstrated the existence of a considerable "washing off" effect which could not be offset even in an ideal direct-flow vat. The experiments showed a deviation from a direct proportionality between basis weight and quantity of drained water. The extent of this deviation was increased by low freeness of the stock, high velocity of stock relative to the wire, high stock consistency, and a low making head.

Further information regarding the process of sheet formation was obtained by studying the physical properties of the sheets formed in the model experiments under different conditions of stock consistency and stock velocity, and different making heads. Fiber length frequency, sheet composition, and sheet porosity were found to be dependent on the stock velocity. Porosity and bulk density were influenced by the making head and the stock consistency. Tensile strength was increased with increasing consistency, and smaller differences in machine and cross-machine strength properties were noted for lower stock velocities and lower making heads. The degree of fiber orientation was found to be increased by higher rates of flow of slurry past the wire.

The influence of fiber fractionation on sheet formation as the sheet is being formed on a cylinder wire is discussed for counter-flow and direct-flow machines and it is concluded that no overflow is necessary for the former type, while direct-flow machines require an overflow provision. The effect of the rate of growth of the sheet on the cylinder wire on sheet formation was discussed and illustrated graphically. The authors ventured the opinion that the importance of varying the making head during the sheet formation process has been neglected in the design of cylinder machines in comparison to the probably less important influence of varying relative speeds of wire and stock.

Drainage Effects and Two-sidedness

George F. Underhay

Differences in the composition and general structure of the top side and the wire side of uncoated mass-produced general printing and newsprint papers were discussed in relation to fourdrinier drainage conditions. Investigations have been carried out on fairly fast machines using newsprint and similar furnishes, and the results of paper analyses, as revealed particularly in loaded papers, show that the amount of the very fine material carried in the top side is likely to be at least twice the amount in the under side.

After many failures to reproduce this composition two-sided effect with normal sheet making equipment in the laboratory, the result was finally achieved by introducing a rapid relative vertical oscillating movement between the wire and the draining water beneath during sheet formation. This disturbs and washes the underside of the immature sheet, and fine material is loosened and removed preferentially from the underside in this way.

It seems that medium and high speed table roll action is similar in that water is squeezed into the wire side at the nip and then withdrawn on the suction side of the roll. Some support for this explanation has been obtained by producing non-two-sided paper on a very slow machine. Although sheet quality is affected remarkably little, solely because of composition two-sidedness, it is suggested that the subject deserves more attention than it has had in the past, particularly since the high wire losses resulting from this action have an important influence on breast box stock properties.

Hydraulics of Flowbox and Slice

W. van der Meer

Application of hydraulic principles were illustrated in the design and construction of flowboxes and slices. Included in the discussion and illustrations were free, widening, and narrowing canals with and without distributing rolls; methods for avoiding free and fixed vortexes in the stock slurries; details for direction changes with bends, tee pipes, branchpipes, cross-spreading,

and flow-spreading; screenplates and screenrolls; and slices. Finally, a review of flowboxes and slices was given which included discussions and illustrations of baffle boxes, airdome boxes, and closed boxes.

Influence of Differential Speeds between Stock and Wire on Sheet Properties

O. Andersson and J. Bergström

The results of studies carried out on the experimental paper machine at the Stockholm laboratory were given. The investigation dealt with the influence on sheet properties of the speed difference between the stock and the wire at the moment the stock is deposited on the wire, as well as lateral conditions governing the way in which this deposition is made and in which water is drained at this point.

It was found that a sheet with a reasonable formation and with very little anisotropy in fiber orientation and mechanical properties can be obtained at the couch by proper settings at the wet end. These properties are, however, easily obstructed during pressing and drying. The setting of the outlet parameters depends upon the velocity distribution and properties of the suspension at the outlet as well as the absolute speed. In the present investigation, which covers the range 100 to 200 meters per minute, the results indicate that the optimum speed difference increases almost proportionally with the speed of the wire; at wire speeds from 150 to 200 m. per min. the optimum stock speed being within the region 10 to 20 m. per min. higher than the wire speed.

The best isotropy and the closest structure of the sheet are obtained if the dewatering is delayed and the formation is allowed to occur under moderate drainage. By earlier and more intense drainage the sheet becomes more oriented but has a better visual formation. Change of drainage rate and draining position does not change the optimum speed difference.

All the data point to the fact that the properties of the sheet made on the paper machine wire vary with the speed difference between the stock and wire as well as the intensity and method of application of drainage immediately after the deposition of the stock on the wire. Generally, these variations appear as maxima or minima, and these maxima and minima can be traced to a common source—the arrangement of the fibers in the sheet.

The following possible answer to the question of why the optimum wire speed should be higher than any speed in the velocity profile of the stock was advanced. When the upper surface of the jet leaves the edge of the outlet and encounters air, this means a drastic decrease in boundary friction. In fact, the air is dragged with the stock and offers very little resistance against the flow at the boundary. Therefore, as confirmed by experiments, the velocity at the boundary quickly catches up with the velocity in the middle of the cross section, and a practically square profile develops throughout the cross section except at the lower boundary, where there is still friction against the apron. When the apron is substituted by the wire, a similar thing occurs. This line of reasoning shows that there is a wire speed higher than the highest stock speed to create an effective stirring action and promote a rearrangement of the fibers. If this wire speed is too high the stirring action might be too violent and the wire might have a combing effect which aligns the fibers again after the alignment produced in the outlet has been destroyed.

Stroboscopic Observations of Wet End

C. C. Porter

The use of the stroboscope was proposed to overcome some of the difficulties experienced in visual observation of what takes place in the forming section of the fourdrinier machine. Four mircoflash photographs of one-thousandth of a second duration were taken with a strobolight: (1) newsprint stock on wire (running at 1500 f.p.m.) near the slice; (2) view of sheet about six feet further down the wire; (3) water leaving the breast roll; (4) illustration of distribution of moisture content of sheet entering driers. In reference to the photographs, emphasis was placed on the use of the stroboscope as an instrument of technical investigation rather than the subject of the illustrations themselves. Other practical applications of stroboscopic investigations are cited, such as its use as a tachometer, and an actual example of its use in locating the source of a badly flapping draw in the drier section.

Laboratory Investigation of Water Removal by a Dynamic Suction Box

Lars Nordman

An attempt was made to study the dewatering under suction of sheets made in the laboratory by means of an apparatus that was built to facilitate application of suction for time intervals approaching those occuring on a fast-running paper machine. Suction times of 0.1 sec. and less were obtained by moving a suction box with a narrow suction slit underneath the wire on which the sheet was formed. The width of the suction opening in the box and the speed of the box determine the time of suction.

The effect on the dryness of the sheet of basis weight and temperature of the sheet and of the time of suction was investigated. Dryness increases as the basis weight decreases and as the temperature and time of suction increase.

For groundwood pulp the amount of fines present in the sheet has a definite effect on the dryness: a high percentage of fine fibers will decrease the dryness after suction. The freeness value of a given kind of pulp is only a rough indication of the dewatering properties under suction.

The dryness of sheets made from chemical pulp decreases sharply with the beating time of the pulp, especially in the early stages of beating. Compared on a freeness basis, groundwood pulp obtains a greater dryness than a chemical pulp beaten to the same freeness value.

In the case of groundwood-sulphite mixtures, the dryness of the sheets is proportional to the chemical pulp addition, the amount of beating of the pulp determining whether the dryness will increase or decrease.

Effect of Wet Pressing on Sheet Properties

D. J. MacLaurin and J. F. Whalen

Relationships between wet pressing and dry sheet strengths were reviewed. Experimental work is presented relating pressure, number of pressings, pulp freeness, and dry sheet properties for unbleached Douglas-fir kraft handsheets. It was concluded that for purposes of increasing the bursting strength through wet pressing, two or possibly three pressings at pressures not over about 300 to 400 lb. per line in., but otherwise as high as possible, would give maximum gain. Pressing to a moisture content of about 50 per cent appeared to be optimum.

Evaluation of Paper Machine Systems by Basis Weight Analysis

George Burkhard and Peter Wrist

Machine direction and profile measurements of basis weight show that the pattern of variations is not stable and is a characteristic of the particular paper machine. A number of different experimental and analytical techniques have been used to study basis weight variations as a means of evaluating paper machine stock systems.

The variation of a single basis weight reading from the average value throughout the reel is considered as the sum of three components, one due to the position of the sample across the machine, one to its position along the reel, and a residual random component. A cutting and weighing method of basis weight evaluation is compared with the use of a beta-ray gauge and the techniques of computing the standard deviation of the three components of variation are discussed. Examples are given of the way these components vary between a number of different high speed newsprint machines and with changing machine speed on a given machine. General conclusions are drawn and the factors which influence each of the three components are discussed.

A method of recording the slice opening across the machine during actual operation is described and the relationship between the slice profile and the stable basis weight profile for one machine reported. A study of the variations of the average basis weight with time was reported and the method of separating cyclic and random components described.

A practical outcome of these studies is the insight it gives into routine methods of basis weight testing and control on the machine. When it is realized that, superimposed on the stable profile and average machine directional variations of substance, most high speed machines have an appreciable random component it will be seen that testing methods which rely on sampling once per reel are liable to considerable error. A continuous measuring method, which can automatically average out the random effect, becomes of increasing value for weight control. In addition, the need for two types of instruments, one to continually meter at a fixed position across the machine and another to periodically test the average weight profile, has been well established. The development of two types of beta-ray gauges along these lines represents a useful advance towards improved machine operation.

Measurement of Paper Machine Draw and Speed Variation

Dalton L. Shinn

A device designed for measuring paper machine draws and speed variations was described. The unit consists of a wheel 24 inches in circumference. The wheel shaft, turning on ball bearings, carries a cam serving to open and close a microswitch at each revolution, and an iron gear. The gear teeth pass close to the pole pieces of a magnetsolenoid unit, so that the solenoid produces an alternating current varying in frequency with the rate of rotation of the gear. The control box and wiring diagram were also described, together with an oscilloscope which is used for determining variations in speed and draw. The operation of the instrument was described and mill data was shown representing a survey of draws and speed variation. Satisfactory operation of the instrument was reported.

Filtration Resistance of Pulp Slurries

Roy P. Whitney and W. L. Ingmanson

This paper was devoted to a presentation and discussion of the average specific filtration resistance as an important property of paper making fibers. The laboratory determination of this quantity through both constant-pressure and constant-rate filtration experiments was discussed and the relative merits of the two techniques are considered. It was concluded that the evaluation of filtration resistance *per se*, and the calculation of fiber properties of specific surface and specific volume should be based on constant-rate data in preference to a constant-pressure method.

Good agreement was shown between pulp specific surfaces obtained from analysis of filtration resistance and by the silvering technique for slurries containing relatively few fines. With more highly beaten chemical pulps and groundwoods, the silvering technique apparently gave spuriously low values for the external surface area.

The relationship between filtration resistance and pulp freeness was illustrated. It was concluded that the freeness measurement was at best only a crude indication of drainage resistance, and was particularly insensitive in the high freeness range.

The effect of pulp consistency on filtration resistance was explored over a wide consistency range of from 0.01 to 1 percent. It was shown that in the paper making consistency range of 0.2 to 1 percent that higher consistencies resulted in lower filtration resistances. The importance of the pulp filter mat moisture content at high consistencies was demonstrated in regard to its effect on calculated filtration resistance values. Examples are given of the method of calculating the pulp mat moisture contents for given pressure drops across the mat and the good agreement with experimental measurements is taken as substantiation of the correctness of the porosity function used to evaluate the fiber surface area and effective specific volume.

Application of the concepts of average specific filtration resistance to the study of drainage on the wire of a fourdrinier machine is proposed. The utility of a precisely defined and laboratory-measured filtration resistance in paper machine studies was emphasized.

The Functions of the Felt in Water Removal on the Papermaking Machine

Alfred H. Nissan

Felt manufacture and felt characteristics were reviewed and the functions of wet felts in the presses were considered. Observations lead to the conclusion that the sheet approaches the press nip as a more or less regularly patterned sheet of wet spots in a less wet continuous network. It was speculated that at the entry into the nip the felt and paper are compressed and water is extruded that is unlikely to have come from the web. In the nip both paper and felt are considerered to be saturated with water and the pressure of the nip compresses the felt and thus reduces the total quantity of water remaining in its interstices. As the sheet and felt leave the nip, both expand and the total quantity of water is then partitioned between web and felt. The forces responsible for this mechanism are considered to be elastic forces in the felt tending to restore its original thickness, and surface tension forces which will displace air from the capillaries.

The mechanism of flow under these postulated forces were considered mathematically, and it was concluded the three requirements for the felt to remove the maximum amount of water per pressing operation are (1) high compressibility or a low modulus of compression, (2) high recovery at rapid rates or high resilience, and (3) high permeability to water. Wool fiber structure, yarn spinning and weaving, and finishing features of felts are considered in the light of satisfying the three felt requirements.

The functions of felts in removing water in the drier section were next considered. Four phases of a "cyclic" process were discussed in which each phase represents a different rate of heat and mass transfer. A liquid absorption mechanism was hypothesized in which water passes bodily into the felt and is then evaporated. Arguments and data from the literature was presented to support the proposed mechanism, and conditions which migh' enhance the mechanism were given: (1) utilization of the long free run of the felt on its return journey to increase the total available evaporation area, (2) air blown *through* the felt to increase the rate of evaporation, and (3) utilization of flue gases to dry the felt before it returns to the sheet (via heat exchange with the air blown through the felt).

Quantitative Study of Water Removal by Table Rolls

W. E. Bennett

The results of a study of drainage from the table roll section of a newsprint machine were reported, in which water removal (rather than formation) was the chief phenomenon under investigation. Experimental data were reported over a speed range of 609 to 692 f.p.m. at stock consistencies of from 0.7 to 0.9 percent, temperatures from 25 to 38° C., and pulp freeness in the range of 43 to 59° Canadian Standard.

Statistical analysis of the data showed that by far the largest factor influencing drainage was that of speed. Measurements were shown of the suction produced in the nip of water at a table roll, and maximum values from about 1 to 30 inches of water were found for speeds from 180 to 630 f.p.m. The distribution of the suction at the underside of the wire was shown over the length of the nip for two table roll diameters of 3 and 9 inches. Rapid increases in the magnitude of the suction to the maximum values followed by equally rapid decreases were found as the measurements proceeded from the top dead center of the roll to the end of the nip (distances along the wire of from 0.2 to about 1.5 inches depending on roll diameter and wire speed. Small positive pressures were reported to have been found just upstream of the table roll top dead center.

Drainage from the breast roll and first table roll did not increase with speed because of the predominance of gravity drainage over the sucking action at this point on the wire. This was the only part of the table where consistency was found to be statistically significant. After this, suction drainage became predominant and the effect at next few rolls was compatible with a square law dependency as previously proposed by Wrist. The suction effect on drainage declined over the last group of table rolls. The explanation is given that the decline was not because of a decrease in suction magnitude but rather because of a compressing of the web of fibers. The fact that resistance to flow of the forming web increased more rapidly than did the sheet weight was attributed in part to the compression of fibers and partly to a greater retention of fines as the mat thickness increased.

The second most important factor affecting drainage was temperature, which was found to be significant over the last half of the table but not over the first. This is explained by the nondependency of turbulent flow on temperature and the dependency of capillary or streamline flow on temperature.

The measurement of stock freeness showed little correlation with drainage and it was concluded that this stock property was much less important than speed and temperature in the range of the experiments. It is noted that the conditions of filtration, particularly in regard to pressure-time effects, are entirely different in a freeness tester than on a high speed paper machine.

Stresses Introduced In A Drying Sheet

Bertil Ivarsson

Quantitative data for stress during drying, shrinkage, and change in moisture content have been determined for various laboratory made papers. It was demonstrated how the drying of the wet sheet causes shrinkage and if an external restraint is applied how the corresponding stress in the web will change the stress-strain properties of the finished paper.

A theory developed by Barkas relating external stress to shrinkage and moisture change in an elastic gel has been applied in order to demonstrate how drying stresses can be calculated, based on thermodynamical data for the sample under test. The theory aids in the fundamental understanding of the subject. Because paper shows plastic flow, however, introduction of values for volume changes in a paper strip during drying in the theoretical equations give too large values for the stress. On the other hand, if the larger shrinkage values obtained under no load are used, the stress data calculated agree well with the experimental.

The drying stress is sensitive to small changes in the shrinkage during drying. In general it was found that a total shrinkage of 0.3 to 0.4% will reduce the tension in the sheet by about one-half. By drying samples under different stress and later determination of stress-strain data it is shown that already small stresses of 1 to 5 kg. per sq. cm. reduce extensibility of the paper considerably.

Fiber Properties Involved in Adhesion and Cohesion With Reference to Wet Web Strength

Wilfred Gallay and L. M. Lyne

Previous studies of the structure and properties of wet webs have been continued and extended. The effects of wet pressing and of beating on the strength development curve with increasing dryness have been determined. Percent voids, i.e., percentages of air by volume in the webs, have been calculated and the importance of voids in relation to surface tension forces discussed. Relationships are shown among percent voids, tensile strength, density, and per cent solids.

Rheological studies have been carried out on wet webs over a wide range of solids contents. A second stress-strain instrument was constructed for applications of heavier loads at higher solids. The wet webs down to about 8 per cent solids show all the usual rheological properties found for dry paper including permanent set, recoverable creep, work hardening, resilience, and memory effect.

The results appear to corroborate strongly the concept of two essentially successive mechanisms, viz. surface tension and inter-fiber bonding, governing the strength and other properties of wet webs. These two mechanisms can be clearly distinguished and separated. The structure of wet web on the basis of these findings is discussed.

Effect of Water Removal on Sheet Properties—The Water Evaporation Phase

Herbert F. Rance

The mechanism of web contraction during drying was discussed in an attempt to establish a roughly quantitative relation between the sorption properties of the individual fibers and the structure and behavior of the paper sheet. A clear distinction was drawn between web contraction due to surface tension between fibers and that due to fiber shrinkage. It was suggested that inter-fiber contraction within the main plane of the sheet is largely irreversible, whereas intra-fiber contraction is largely reversible, and can be roughly estimated through the water expansivity of the dried paper. Bonding between fibers plays a vital role in fixing inter-fiber contraction, and in transmitting intro-fiber shrinkage to the web. A third type of web contraction due to the twisting of fibers on drying, was postulated to account for anomalous reversibility of the contraction of webs made from unbeaten stock.

Intra-fiber web contraction was held to be a major cause of structural distortions, which are the source of a great part of the extensibility of freely shrunk paper. This shrinkage-induced extensibility manifests itself through straightening of crumpled fibers, with consequent breaking of fiber to fiber bonds. Reinforcement of bonds by use of amino resins can eliminate shrinkage-induced extensibility. The effect of drying tensions on water expansivity, extensibility, and tenacity were discussed. Drying tensions affect the shrinkage and expansion of paper only over a moisture range corresponding to original conditions of application of tension. Tenacity caused by drying tensions is due to enforcement of a tighter bonding pattern, with consequent avoidance of piecemeal disruption.

The influence of fiber orientation on this pattern of effects was discussed. Complete orientation leads to a pattern of properties clearly distinguishable from that existing with randomly oriented paper dried under machine tension. Partial orientation introduces extra complications. More research was suggested as needed to check the proposed trends, and to verify the validity of quantitative estimates.

Elastic Theory of Nip Stresses and Hysteresis Effect

Homer E. Malmstrom

This paper was concerned with the heat in supercalenders and the mechanism by which it is produced. The work was initiated when the need arose for selecting a size of motor to operate a new supercalender, which was different in roll size and arrangement from anything used before. Neglecting lesser variables such as bearing friction, windage losses, and differences in ingoing and outgoing sheet tension, the principal factors which affect the power used are (1) speed of roll travel, (2) length of roll face, (3) applied load, (4) roll diameters, and (5) roll arrangement. It is reasonable to expect that the power required will be directly proportional to speed and to length of roll face. Measurements on other supercalender stacks show that motor power varies approximately as the three-halves power of the total nip loading. The effects of roll diameter and roll arrangement are not as easily seen and they are determined by a theoretical study of roll deformation in the nip. It is this deformation which requires most of the motor power and produces all the heat. The relationship which is developed for energy loss in a supercalender roll shows the anticipated relationships for speed, length, and loading, but also depends on a diameter function, the hysteresis constant, and a function of Young's modulus. Details, necessary mathematical relationships, and results were presented for the experimental determination of the hysteresis constant and the elastic modulus. The experimental values were used in equations giving horsepower requirements for fiber-filled rolls and steel rolls in supercalender stacks.

Temperature distribution in fiber-filled calender rolls was discussed. The conclusion was reached that burnouts and charring can be expected to occur somewhere between the surface and 0.6 inches below the surface depending upon the rate of heat production.

OBITUARIES

Domenic DeStefano, 81, of 25 Carruth st., Dorchester, Mass., prominent paper mill supplier, died at his summer home in Norwell on August 18 after a long illness.

A native of Avellino, Italy, he came to this country in 1893 at the age of 20, and later founded his paper mill supply house on Damrell st., South Boston. Over a 54-year period, his business reached a national scale.

George Letemplier, 49, woods manager of the Canadian International Paper Corp. operation at Pentecost, Que., for the past six years, died suddenly September 18. Associated with the company 28 years, he was superintendent at Clova in the Abitibi region prior to the Pentecost appointment.

Bert M. Lewis, director and general manager of Nicolet Paper Corp., West De Pere, Wis., died September 11.

Maine Industry Shows Off Its Timber

Paper and pulp executives from Savannah to Minneapolis were recently treated to an APPA sponsored tour of Maine's forest empire, including a preview of Great Northern's mill expansion.

Bruce Otis,
Associate Editor, Paper Trade JOURNAL

From September 15 through 17, more than 50 executives, many from pulp & paper companies in other parts of the country, hit the trail through the timberlands of Maine as guests of Maine pulp & paper firms on the fourth Forestry Tour sponsored by American Paper & Pulp Assn., Forest Policy Committee. The group received not only valuable instruction in Maine forestry practice but also an eye-opener look at the new pulp and paper installation at Great Northern Paper Co.'s East Millinocket mill.

The group met at the University of Maine in Orono, and the University became the base of operations. The visitors were lodged in one of the dormitories, and a college cafeteria served breakfast each morning. The hospitality extended the group was not limited to that offered by the pulp & paper companies. Mr. and Mrs. Curtis M. Hutchins of Bangor also entertained all the members of the tour with dinner at their home on the first evening of the gathering. Mr. Hutchins heads the Dead River Co. and the Bangor-Aroostock Railroad.

HORSEPOWER IN TRACTOR AND IN THE FLESH make an efficient team for twitching cut logs to bucker at the road side.

Experimental Forest

Thursday morning the tour traveled by bus to the Penobscot Experimental Forest in Bradley and Eddington townships, southeast of Orono. This forest is administered by the Northeastern Forest Experiment Station through its research center at Bangor. In immediate charge is U. S. Forester Thomas McLintock, who explained to the tour exactly how the Station operates on the tract and what the aims of the project are. The 3800-acre tract was purchased in 1950 — nine private companies participating in the ownership. It was then leased to the Northeast Forest Experiment Station for research in forest management. This was a unique move in American forestry. It was the first time that a group of wood-using industries had leased such a tract to the Federal Government for research. Already much has been learned from the experiment.

While the research goes on, the Station also conducts commercial logging operations on the tract. It turns over to the owners' Operating Committee the stumpage payments for products harvested. From these receipts the Operating Committee pays the taxes on the property.

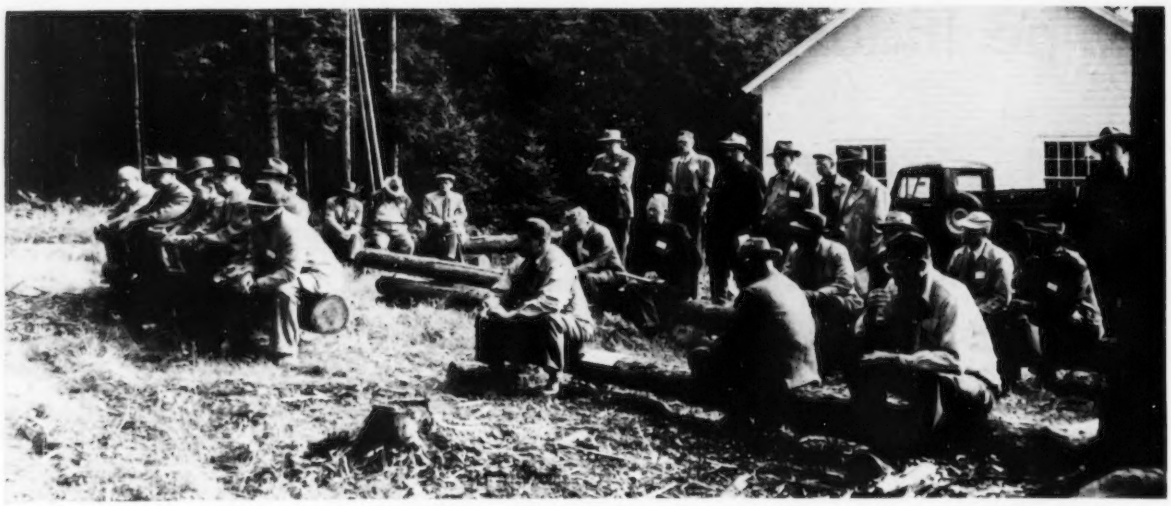
Penobscot Development Farm

Next stop on the Thursday tour was the Tree Farm of the Penobscot Development Co., which is the timberland subsidiary of Penobscot Chemical Fibre Co. This 11,000-acre tract was certified as a Tree Farm in 1953. L. J. Freedman, vice-president, Penobscot Development Co., who had been responsible for many of the arrangements of the entire tour, described the forest practice in his tract. One stop was made to observe a stand of chemically-debarked trees. Penobscot is pleased with the results of their chemical debarking trials on both hard and soft wood species.

Penobscot was host at its lumber camp to a woods lunch for the entire party. The core of the meal was a New England boiled dinner with plenty of extras that produced a real "groaning board."

Dead River-Eastern Corp. Farm

Thursday afternoon's journey took the group to the forest lands around Springfield, Maine. These woods make up the Tree Farm of the Dead River Co.—Eastern Corp. operation. This joint forest management project is operated under a long-term lease, with Eastern Corp. doing the cutting on spruce, fir, and hemlock and following the cutting practices as laid out by the Dead River Co. All the spruce, fir, and hemlock pulpwood is cut on a selective basis with an 80-year rotation and a 40-year cutting cycle. The areas were set up to allocate the area by 5-year periods during the first 40 years cutting cycle.



A LESSON IN COOPERATIVE WOODS RESEARCH is taught these visiting executives. They are listening to U. S. Forester Tom McLintock report what he and assistants are accomplishing on the Penobscot Experimental Forest project, in which nine private companies are cooperating.

Details of the operation were explained by Dwight DeMeritt, manager of the Dead River operations. The sightseers were able to observe a cutting operation along the road. A tractor and a horse were both being employed to twitch peeled logs out of a partially cut-over stand. One bucker cut the logs with a portable power saw. At another spot the group watched a demonstration of a crane-operated clam-shell grapple being used to load cut logs into a truck.

Lobster Dinner

The Maine pulp and paper companies entertained the members of the tour Thursday evening with a lobster dinner at the Penobscot Valley Country Club. Toastmaster was Eugene Clapp, president of Penobscot Chemical Fibre Co. Among the after-dinner speakers he introduced were E. W. Tinker, executive-secretary of APPA and Terris Moore, director of the Dept. of Industrial Cooperation at Univ. of Maine.

JUDGING THE PERFORMANCE OF A CLAMSHELL GRAPPLE are (L to R) Amor Hollingsworth Jr. (Tileston & Hollingsworth), Norman Stone (Mosinee Paper Co.), C. J. McLaren (National Container Tomahawk), Henry Perry (Waste Paper Utilization Council).

Junket to Great Northern

Fog and rain forced cancellation of the projected air trip over Maine's northern empire on Friday. However, the tour moved out again in buses and traveled up to view woodhandling operations at the Millinocket and East Millinocket mills of Great Northern Paper Co. On the way north the group stopped at a pulpwood yarding area belonging to International Paper Co. Here the visitors were able to see first-hand several of the new type rack cars now in use on the Maine Central Railroad.*

At Millinocket, the group observed the dumping of pulpwood from specially constructed box cars with swinging sides. Rail shipment of wood is important to Great Northern's operations; however, the bulk of the wood cut by the company is left along the vast waterways during the winter and is washed down the river system in the spring. A view of several of Great Northern's power dams and pulpwood storage flows gave the visitors a fair conception of how large and efficient a production unit the company is.

Friday afternoon the group moved on to East Millinocket where guides were furnished to conduct the visitors.

Preview Of G. N. Expansion

The Forestry visitors were privileged to see history in the making at East Millinocket. Soon to be in operation there are a new groundwood pulp mill including a revolutionary chemi-groundwood operation and a two machine paper mill that will add 500 tons per day of newsprint to East Millinocket's output.

*(See "Open Side Pulpwood Cars Made Safe for Northern Shipment," *P.T.J.*, August 6, 1954.)

OFFICIAL HOSTS AND HONORED GUESTS—(L to R) A. D. Nutting, forest commissioner, Maine Forest Service; E. W. Tinker, executive secretary, APPA; Dr. A. A. Hauck, president, University of Maine; Eugene H. Clapp II, president, Penobscot Chemical Fibre Co.; Harold Holden, president, Eastern Corp.; Terris Moore, director, U. of M. Dept. of Industrial Cooperation; J. L. Madden, president, Hollingsworth & Whitney Co.; J. Gannett, executive-secretary U. of M. Foundation.

Of special interest were the two new vertical pressure tanks that will receive four-foot sticks of hardwood pulpwood and pre-treat them prior to grinding. Unique hydraulically-operated covers at the top and bottom of the pressure tanks will allow the logs to be loaded and discharged in bulk by force of gravity.

One of the two fourdriniers is just about ready to start. It is rated at 276 inches wide and is designed to operate faster on newsprint than any other machine in existence.* This trip through East Millinocket completed the Forestry Tour, and all in attendance were grateful for the interesting and educational insight into the importance of sound woods operation to the industry in Maine.

*(See "Two New Mills at East Millinocket," *P.T.J.* Apr. 9, 1954.)

EXPLAINING CUTTING PRACTICES ON THE DEAD RIVER—Eastern Corp. Tree Farm is Dwight De Meritt, woodlands manager of Dead River Co.

NEW LITERATURE

A.B.C. Of Modern Lubrication. (Bulletin) Covers three basic elements of automatic lubrication—lubricators, distribution systems and meter-units, including illustrations and detailed descriptions of each. Bijur Lubricating Corp., Rochelle Park, N. J.

Choosing the Right Valve. (20p, Two-Color Pamphlet) Contains valuable information which will serve as a handy refresher in the application of basic valve designs for specifiers and buyers of piping equipment. Crane Co., 836 S. Michigan Avenue, Chicago, Ill.

Controlled Volume Pumps in Process Instrumentation. (Bulletin 1253) Section one describes various types available, how they operate and how stroke length and speed adjustment can be effected manually and automatically. Section two contains process flow diagrams describing typical applications in chemical, paper, water treating and other industries. Section three includes engineering data. Milton Roy Co., Station Y, 1300 E. Mermaid Lane, Philadelphia 18, Pa.

How to Overcome Your Welding Problems and Improve Your Welding Techniques. (8p. Booklet) Informative handbook written by welders for welders who wish to increase their knowledge and improve their skill. Also should prove useful to metallurgists and welding engineers. Eutectic Welding Alloys Corp., 40-40 172nd street, Flushing 58, N. Y.

Horizontal Mixed and Axial Flow Propeller Pumps. (Form 7280) Incorporates dimensions, materials table and sectional drawings showing features of pumps with detailed explanations. Designed for wide range of process industry and paper mill applications, they are now available in sizes 10-24 inch with pressures to 25 p.s.i. and capacities to 16,000 g.p.m. Ingersoll Rand Co., 11 Broadway, New York 4, N. Y.

Streamlined Baffles. (Bulletin BW 54) Shows modern boiler baffling as developed and sold under the trade name ENCO. First it describes materials used and methods of construction, and second, the engineering involved in designs, with pictures and drawings showing installations with brief comments. Engineer Co., 75 West street, New York 6, N. Y.

Shaft Mounted Drives by Falk. (Bulletin 7101) Includes design data, selection tables, dimensions, weights, installation information and photographs of this all steel shaft mounted drive which offers high ratios of speed reduction in limited space. Falk Corp., 3001 W. Canal street, Milwaukee 8, Wis.

Silicate P's & Q's. (Volume 34-9) Tells the story of the discovery by TS'ai Lun, in the year 105 A. D. in China, of a method of pulping tree bark, bamboo and rags to make paper suitable for writing, how this was spread to the western world during the following centuries and the numerous uses of silicates in solving the many problems involved in the manufacture of paper. Philadelphia Quartz Co., Public Ledger Bldg., Independence Square, Philadelphia 6, Pa.

Syphon Scoop. (Bulletin 265) Explains fundamental principles of new Armstrong "Syphon Scoop," and lists results of manufacturer's tests. Armstrong Machine Works, Three Rivers, Mich.

Simplex Measuring and Control Equipment. (Bulletin 050) Contains general information on both primary and secondary measuring devices, including miscellaneous types of air release and air inlet (vacuum breaking) valves and new Type CCAV controlled closing valve. Simplex Valve & Meter Co., 68th & Upland streets, Philadelphia 42, Pa.

Why the Small Fork Truck? (28p. Booklet) Shows how small and medium sized plants can compete with big business in materials handling efficiency. Analyzes the space, time and labor factors involved in small plant operation and suggests fundamental solutions derived from the author's, Nathaniel Warshaw, 30 years of experience in design and manufacture of this equipment, and based on actual results of their application in plants throughout the world. Materials Handling Div., Market Forge Co., Everett 49, Mass.

(Continued on page 34)

NEWS OF ASSOCIATIONS

Donnelly Research Man to Address Michigan Supers

Dr. Marvin C. Rogers, director of research, R. R. Donnelly & Sons, Chicago, is to address the October 21 dinner meeting of the Michigan Division of The American Pulp and Paper Mill Superintendents Assn. at Hotel Harris, Kalamazoo, Mich. His subject will be "Paper Printability."

Dr. Rogers plans to approach his subject in a manner understandable to the papermaker. He will relate some experiences of printers with paper. He will touch upon printability as it relates to the ink, the way paper performs in going through the equipment, and the way that the printed job gets into the users' hands.

Such paper properties as smoothness, compressibility, feel, etc., will be discussed by Dr. Rogers as viewed by the printers. He also will touch upon the problems of usability of papers, with particular reference to heat-type printing.

It is the desire of Dr. Rogers to set up a relationship between the printer and the papermaker that will make for a more common understanding of mutual problems.

Superintendents Local Meeting Dates

DATE	DIVISION	PLACE
Oct. 9	Connecticut Valley	Berkshire Inn Great Barrington, Mass.
Oct. 13-15	Southern & Southeastern Fall Meeting	George Vanderbilt Hotel Asheville, N. C.
Dec. 3-4	Pacific Coast Div. (Annual Meeting)	New Washington Hotel Seattle, Washington

TAPPI Local Meeting Dates

DATE	SECTION	PLACE
Oct. 6-8	Ohio	Biltmore Hotel Dayton, Ohio
Oct. 8-9	New England Annual Meeting	Berkshire Inn Great Barrington, Mass.
Oct. 18	Chicago	Chicago Bar Assn. Chicago, Ill.
Oct. 18-20	Delaware Valley	Benjamin Franklin Hotel Philadelphia, Pa.
Oct. 19	Metropolitan District — Empire State	Fraunces Tavern Pearl and Broad Sts. New York, N. Y.
Nov. 4	Kalamazoo Valley	Hotel Harris Kalamazoo, Mich.
Nov. 9	Pacific Instrumentation	Bellingham, Wash.

Conn. Valley Supers Announce Fall Program

The Connecticut Valley Div., American Pulp and Paper Mill Superintendents Assn. will meet Saturday, October 9, at the Berkshire Inn, Great Barrington, Mass.

Included in the morning program are mill visits to Byron Weston Co., Inc., Dalton, Mass., or Columbia Box Board Mills, Inc., Chatham, N. Y.

A business meeting will take place at noon, followed by lunch. The afternoon will be given to a golf tournament at Wyantenuck Country Club, Great Barrington. For the ladies there will be bridge and canasta. A get-together party, sponsored by the Affiliates will get underway at 6:30 p.m. The Bolton Award for the Connecticut Valley Division will be presented to William Holmes of the Strathmore Paper Co. by L. R. Mitchell, John W. Bolton & Sons, Inc.

Awarding of golf prizes, ladies' bridge and canasta prizes will take place at dinner, followed by dancing in the ballroom.

Northeastern Div. Holds 34th Annual Meeting

The 34th annual meeting of the Northeastern Division of the American Pulp and Paper Mill Superintendents' Assn. was held at the Poland Spring House, Poland Spring, Maine on September 23, 24 and 25.

Thursday was given over to registration and informal gatherings.

F. Alexander Magoun, president of Human Relations Inc. of Boston, Mass. and lecturer of Cornell, M.I.T., Harvard, University of Washington and University of Chicago and author of several books on the subject addressed the general meeting on Friday morning on "Human Relations in Industry". Sam Orton, president of Orton Corp., Fitchburg, Mass. spoke at the afternoon session. His subject was "Roto Belt".

Harry Hadley, President of the national association, presented the annual Fred C. Boyce student award to Joseph Bergoni of the University of Maine.

The presentation of the Bolton Divisional Award was made by Larry Mitchell to Albert Surprenant of International Paper Co., Chesholm, Maine.

The meeting was attended by about 400 members and guests.

The business meeting was held on Friday afternoon and the following officers were elected for one year: Rudolph Greep, Chairman; James Snyder, 1st Vice-Chairman; Howard Waldenmeyer, 2nd Vice-Chairman and Frank Knight, 3rd Vice-Chairman. Mrs. Marion Stewart is Secretary-Treasurer.

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When purified CMC is added at the calender stack, the surface of the finished board will soak up less ink—resulting in savings as high as 40% in the gloss ink necessary without detracting from the glossy appearance of the final printing job.

As a beater addition, in making paper from lightly beaten pulp, CMC can give strength equivalent to that obtained from highly beaten pulp without CMC. Sheet formation is often improved. Added in the sizing tub, CMC alone or in conjunction with starch gives improved sizing, better finish and erasure qualities, and improved feel.

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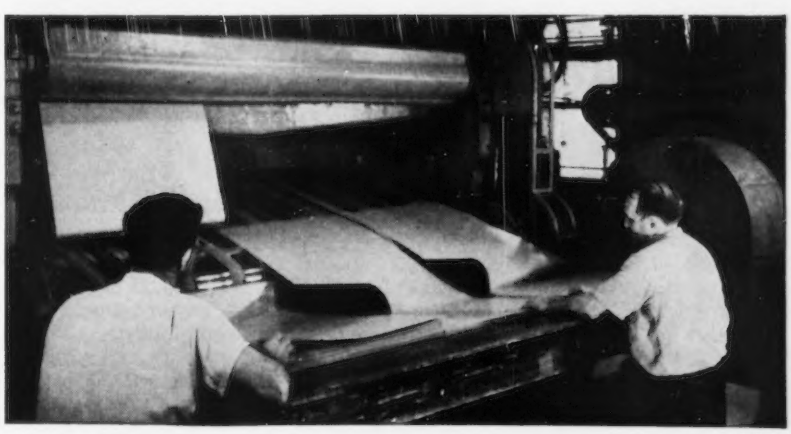
SALES AID—High gloss printing at savings of as much as 40% in gloss ink is possible when purified Hercules CMC is added during the manufacturing of top-quality paperboard.



PRODUCTION AID—A simple application of CMC at the calenders gives board with better surface, for printing and appearance.

CM54-12

LAKE STATES TAPPI HEAD TABLE—Roy Whitney, J. A. Van den Akker, H. Crandall, K. C. Logan, G. F. Underhay, B. Steenberg, L. A. Moss (Chairman), J. R. Salvesen.

L. A. Moss (Chairman), J. R. Salvesen, R. G. MacDonald, R. de Montigny, Douglas Jones, R. Seidel, J. R. Parsons, J. W. Bard.

Lake States TAPPI Hears Steenberg

Lake States Section of TAPPI held their September meeting at Appleton, Wis., on September 23, during the Fundamentals of Paper Machines Conference. This was a dinner meeting presided over by the section chairman, L. A. Moss, mill manager, Whiting Plover Paper Co., Stevens Point, Wis. The very distinguished headtable shown in the accompanying photos included representatives of the technical associations of a number of foreign countries as well as the officers of the local sections.

The principal speaker of the evening, Dr. Steenberg, was introduced by J. R. Salvesen, director, chemical division of Central Research of Northern Corp. Dr. Steenberg, who is director of the paper technology department of the Swedish Forest Products Laboratory, spoke on his theoretical approach to the subject of pulp screening. Although Dr. Steenberg's work on screening has been of a highly mathematical nature he has the exceptional ability to explain his work in ordinary language. At the same time he is both informal and entertaining as well as enlightening.

Wins 2nd Prize in Worthen E. Brawn Competition

Albert J. Marchand, chemist in the technical department of Fraser Paper, Limited, Madawaska, Maine, recently received an award of $50, the second prize in the Worthen E. Brawn competition sponsored annually by the Maine-New Hampshire Section of TAPPI. Mr. Marchand received his award at a recent meeting of the section for a paper he submitted on the retention of latex in pulp stock in the manufacture of resin containing paper.

Sponsored annually by the Maine-New Hampshire Section of TAPPI, the Worthen E. Brawn award competition is designed to encourage technical investigation and research by younger men. It was established by the section in memory of its founder, the late Worthen E. Brawn who at the time of his death in 1947 was national president of TAPPI.

A. J. Marchand

Mr. Marchand, who is 21 years of age, joined Fraser Paper, Ltd. in his present position following his graduation from Lowell Technological Institute, Lowell, Mass. last June when he received the degree of bachelor of science in paper engineering.

Economic Education Forum Plans Meet At Western Michigan

The Southwestern Michigan Community Relations Forum held its initial meeting of the new year on economic education September 29, at Western Michigan College.

The forum is made up principally of executives of the Michigan paper industry, but does welcome other interested persons.

Daniel T. Quirk, president of the Peninsular Paper Co., Ypsilanti, will preside, and will open the morning session with a brief talk on "Purpose of the Forum on Economic Education." Mr. Quirk is chairman of the Forum's steering committee.

Hugh C. Hoffman, of the Opinion Research Corp., Princeton, N. J., will speak on "Effectiveness of Economic Education Programs." He will be followed by John B. Vail, Dow Chemical Co., speaking on "How Our Business System Operates."

After the luncheon, there will be a panel discussion on "How Can Programs on Economic Education Be Developed in Our Own Communities?" Included in the panel will be Mr. Hoffman and Mr. Vail, George Rideout, director of the Detroit Institute for Economic Education, and James Duncan of the First National Bank, Kalamazoo. Robert Ramsey of the Port Huron Sulphite and Paper Co. will be the moderator.

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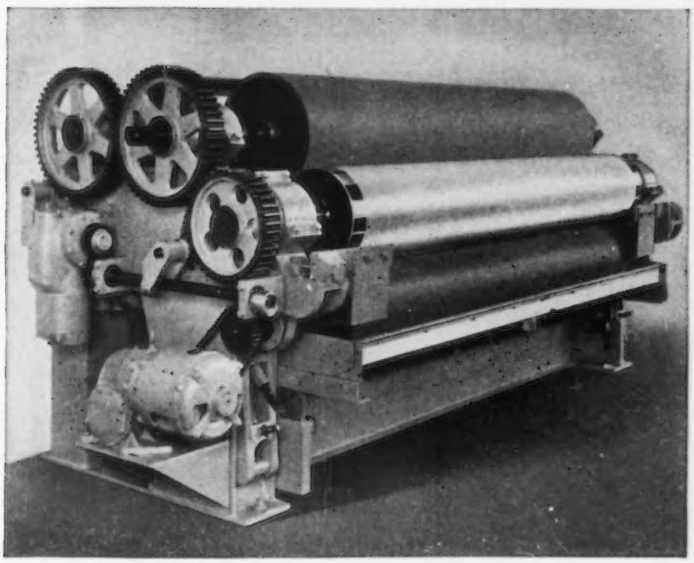

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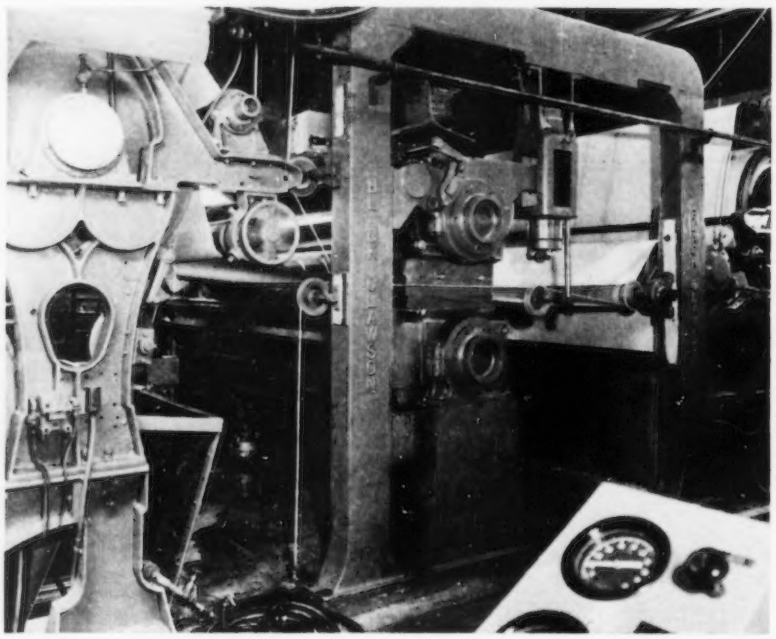
NEW EQUIPMENT AND SUPPLIES

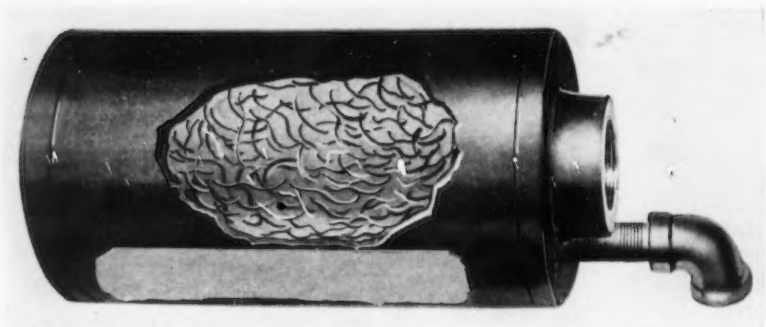


Size Press in New Design

Black-Clawson Co., 2nd and Vine Sts., Hamilton, Ohio has recently developed a size press that employs what is described as an entirely new concept of press loading. Loading involves two rotochambers—one for loading and one for lifting.

The manufacturer reports that neither of these rotochambers have any packing gland piston rod guides or other friction creating parts. They are open to the atmosphere on the piston rod side.

Another feature of the design is the absence of clevises to make connection between the press arm and the rotochambers. Spherically shaped nose pieces are used instead. Mounted on each rotochamber, they fit into conical sets on the top and bottom of the press arm, thus engaging and disengaging the press arm, depending on which rotochamber is being used.



Oil Vapor Filter for Vacuum Pumps

An oil vapor filter that employs a static electrical charge to help prevent danger of oil contamination has been developed by Leiman Bros., Inc., 102 Christie St., Newark, N. J., for their pressure and vacuum pumps. It is expected to be especially useful in fields where oil contamination of the product is a critical problem.

The filter operates on the principle that air entering at a high velocity charges special filter material with a static electrical charge that attracts any small particles of oil. The oil vapor condenses on the fibers of the filter material and drains to the bottom of the filter chamber and then out of the end connection. The installation of this vapor filter does not in any way reduce the efficiency of the pump, it is said.

Rubber Pads to Cushion Paper Rolls

Specially designed pads of foam rubber are now available for preventing dents, gouges, and roll distortions in the handling of paper rolls. Known as Holcombe "Crashpads," they are made of foam rubber, higher at one end than at the other, and covered with vinyl-coated nylon. Leather-reinforced air vents on the sides expel air on impact, and the pads are equipped with handles on both ends and sides for easier, quicker positioning. They are made by Gordon Holcombe Co., Inc., 32 Clay St., San Francisco, Cal.

The pads are available in various sizes. The most popular sizes are the 24 inch x 36 inch pads, 4 inches thick at one end and 9 inches thick at the other, which is built to take the impact of rolls weighing up to 900 pounds, and 30 inch x 50 inch pad, 6 inches thick at one end and 12 inches thick at the other, constructed to handle rolls up to 2,000 pounds. Additional sizes may be obtained to fit any job.

Sectional Belt Conveyor For Customer Assembly

Stephens-Adamson Mfg. Co., Standard Products Div., Aurora, Ill. now offers a complete set of belt conveyor components pre-engineered for customer assembly. Units are designed for lengths up to 50 feet and from 51 feet through 100 feet in both 18- and 24-inch belt widths. Limiting capacity for 18-inch belts is 150 tons per hour and for 24-inch belts 250 tons per hour.

The conveyor components include the carrier and return roll, head and tail pulley assemblies, drive assembly, normal duty roller type holdback, spring type belt cleaner, bent plate decking, belt and Swivelpiler for extending storage area at conveyor discharge. Users may choose either a speed reducer drive with overhead motor mounting or a shaft mounted reducer.

All conveyor components are available from stock and can be purchased as a package unit for a complete belt conveyor installation or as repair or replacement units on existing conveyors. Complete data is contained in Bulletin 1454, available from the manufacturer.

SMIDTH

ROTARY KILNS
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The illustration above shows a modern Smidth Rotary Kiln for reburning lime sludge at the plant of the West Virginia Pulp & Paper Co., Charleston, South Carolina.

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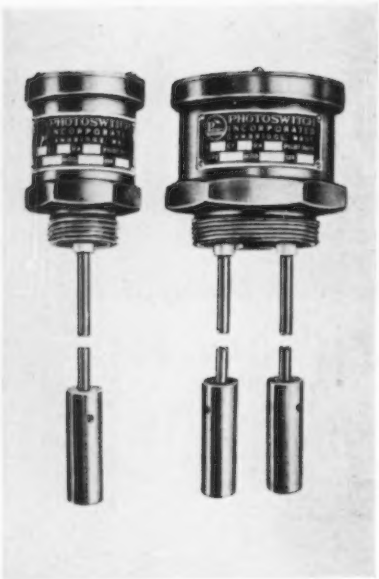


Probe Fittings For Level Detection

Photoswitch Probe Fittings Series 67 for level control of all electrically conductive liquids are designed to eliminate the need for stuffing boxes, floats or any moving parts it is said. The liquid itself provides a path for a minute electric current which actuates the level control to start or stop pumps, give an alarm or perform any other control function. Several probe fittings can be mounted in the same tank to provide a variety of complex pumping operations. They are made by Photoswitch Inc., 77 Broadway, Cambridge 42, Mass.

Metal parts making contact with the liquid are made of No. 303 stainless steel, and no rings or washers are present which could become corroded. The probe rods are insulated with Teflon. This insulation material precludes the formation of moisture film thus insuring extremely high insulation resistance even in saturated atmospheres, according to report.

The fittings are supplied with a variety of cast housings to meet all installation requirements. These housings may be specified in bronze, cast iron or No. 316 stainless steel, and all contain threaded openings for conduit connections. The probe fittings are adaptable to any probe length from 2¾" to 9 feet using standard stainless steel extension rods. For lengths over 9 feet, models with insulated suspension wire and heavy probe tip can be specified. Bulletin PF 544 is available from the manufacturer.

Larger Coil Holder For Wire Stitching

Wire stitching machine operations can now be conducted with a new 50 lb. coil holder that is mounted on the stitcher. The coil holder is made available by Acme Steel Co., 2840 Archer Ave., Chicago 8, Ill. Designated as the Model P1C, the new coil holder was developed for single-head and double-head box stitchers to allow longer stitching runs and shorter stops to reload.

The controlled brake is self-adjusting, so wire feeds more easily and smoothly from the new coil holder, it is said. The brake is released and applied gradually. Initial pull on the wire is absorbed by a flexible coil spring arm. The brake is disengaged when the reel turns, thus reducing the load on the wire feed mechanism.

Pre-lubricated, anti-friction ball bearings are used in the coil holder and sealed from dust and dirt. No oiling is said to be necessary for these ball bearings. The coil holder is loaded by removing the reel plate with a quarter turn to the left; the coil is then slipped on the holder and the plate replaced. Coil holders are mounted close to floor so little lifting is required.

Smaller Model of Optical Straightedge

A beam of light, interrupted by the inscribed reticle of a precision "feeler" microscope, measures deviations as small as .000025 inches on flat surfaces up to 20 inches long, in the Griswold Huet Optical Straightedge. Previously available only in five- or ten-foot length, the new 20-inch model permits use of this measuring method to smaller-scale machining or polishing operations. The manufacturer is F. T. Griswold Mfg. Co., 305 W. Lancaster Ave., Wayne, Pa.

A prism-and-lens housing, resting on two metal blocks over the work, permits the feeler microscope with its built-in illumination to ride along the surface under examination. Deviations observed through the microscope are indicated by the relative position of two indices.

Test Units That Predict Behavior of Equipment

Revealed at the recent International Instrument Congress and Exposition in Philadelphia was an electronic testing system that is said to permit engineers to estimate the effect of the addition of new equipment to an industrial operation without actually test-installing such equipment. Known as a Servo Analyzer, the system was developed by Minneapolis-Honeywell Regulator Co., Industrial Div., 5000 Wayne Ave., Philadelphia 44, Pa.

According to report, the new system automatically translates behavior characteristics of given equipment to a chart record. This, in turn, is analyzed to determine how such a component will affect the over-all behavior of the operation.

In operation, the system puts a control or a group of controls through their paces to see if they perform correctly when specific conditions are altered. This is accomplished by automatically introducing a rhythmic change (similar to alternating current) into a process.

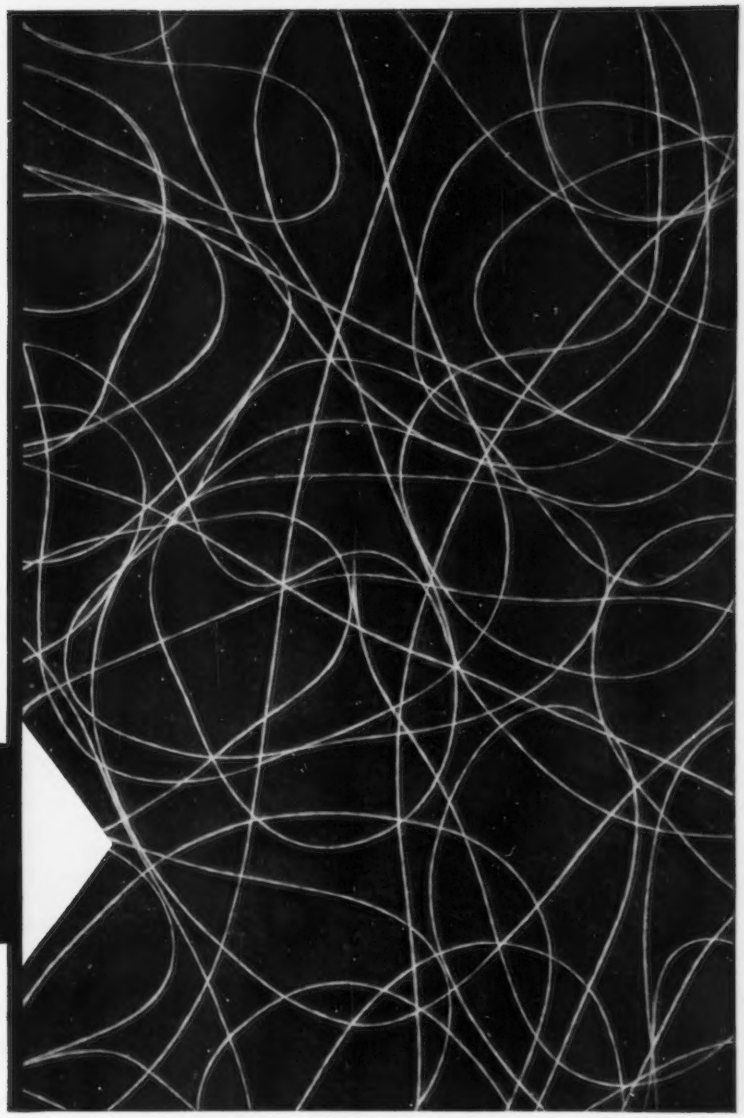
The analyzer then automatically is made to measure and plot the effects. The manufacturer states that the analyzer can complete and record an entire test in as little as eight minutes.

The system, which is portable, is made up of four components: a single generator, a portable potentiometer, a control box, and a function plotter. It provides three forms of test energy — pneumatic, mechanical, and electrical.

Combined Pressure and Temperature Valve

A single main valve designed to give both temperature and pressure control has been developed in a new model by Kipfel Valves, Inc., Hamilton, Ohio. The valve is known as No. 1649 and is recommended to prevent the hunting, cycling, or overheating that sometimes occurs with a temperature control alone.

In operation, the valve is set to meet the maximum demand of the system's pressure. Pressure reducing is accomplished when the pilot valve senses the downstream pressure. It then opens or closes to maintain set pressure. This action is supplemented by the temperature control pilot which shuts the main valve when the temperature point is reached. This closing occurs regardless of downstream pressure. When control temperature falls below the set point, the main valve opens and the pressure reducing function resumes automatically.



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PITTSBURGH PLATE GLASS COMPANY

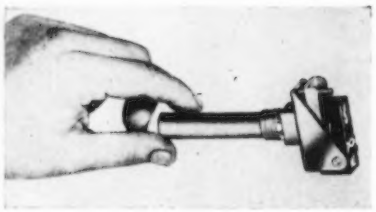
Redesign Green Liquor Clarifier as Single Unit

Dorr Co., Barry Pl., Stamford, Conn., has redesigned the green liquor clarifier and dregs washer in the Dorr Continuous Recausticizing System. The change is based on the principle of selective density feeding, and involves the substitution of a single unit compartment clarifier equipped with a special feedwell for the four compartment machines previously used in the green liquor section. The manufacturer claims that investment and operating costs are reduced by this design, and that overflow clarity is comparable to that of tray units.

In the new unit compartment clarifier the large diameter deep feedwell extends down toward the raking mechanism. The clarifier has a ten foot sidewall depth and twelve to sixteen foot center depth, depending upon the diameter of the unit, unless a deeper tank is required to obtain hydrostatic head for gravity flow. Unit compartment design is also used in the dregs washer, although the tank and feedwell are more shallow than in the green liquor clarifier. Dregs and wash water are pre-mixed externally in a small tank having a thirty minute detention time. Pumping of dregs from the green liquor clarifier is controlled by a time clock which actuates the pump every fifteen minutes.

It is reported by the manufacturer that field tests have established that tank volume was not fully utilized in existing four compartment tray units in the green liquor section. At the same time, research to promote maximum utilization of clarification capacity, disclosed that short circuiting could be minimized by introducing unclarified feed at a point where solids concentration in the tank is similar to feed concentration. In such manner, maximum flocculation of solids in suspension is assured. It is reported also that research revealed an optimum relationship between detention time and overflow rate. Translation of these data, the components of the selective density feeding principle, to practical design involved a single, deep, mechanically raked clarification compartment equipped with a large diameter deep feedwell terminating near the raking mechanism.

Green liquor clarifiers of this general design have been installed in several mills presently in operation or under construction. Some of these same plants have also adapted the modified dregs washer. The manufacturer claims that initial installed costs and maintenance costs are substantially reduced because of the elimination of three mechanisms and trays. Operating attention is minimized as there are no longer any seals between compartments to maintain and overflow sleeves to adjust.



Snap-Action Thermostat

To meet the need for a thermostat having both a heavy duty load-carrying capacity and small differential, Fenwal Inc., Ashland, Mass. has developed a series of liquid-filled, snap-action type thermostats to supplement its line of precision temperature controllers. The snap-action thermostat is recommended for application where the ability of the thermostat itself to carry heavy electrical loads (20 to 35 amps) without relay is more advantageous than the precision temperature response (0.1F), but lower load carrying capacity, typical of the slow make-and-break type of thermostat.

Two models—one, for remote installation; the other, for direct installation (local bulb type)—are available. The local bulb unit is designed for use over an adjustable 50 to 300 degrees F. range, while the remote unit is available in two ranges: 50 to 250 degrees F., and 150 to 550 degrees F. Up to 25 feet of tubing can be furnished with the remote model, it is said.

The local bulb thermostat consists essentially of a sealed bellows encased in a liquid-filled outer shell, plus a snap switch in direct linkage. On temperature rise, the liquid expands against the bellows, causing it to trip the snap switch and thus operate the electrical contacts. Since the liquid is in direct contact with the outer shell, which has a heat sensing area of nearly 10 sq. in., the response time and sensing accuracy of the thermostat are claimed to be unusually good. The snap switch pivots against the reaction of a torsion spring which permits the whole assembly to "lift" without damage if exposed to extreme temperature overshoot. This model, which has a diameter of $\frac{5}{8}$ inches and a sensing leg of $3\frac{1}{2}$ inches long, is furnished with a standard $\frac{1}{2}$-inch pipe thread fitting for installation.

In the remote model, diameter of the bulb is approximately 3/16 inches, and its length 11 inches. The control mechanism is housed in a flanged 3 x 3 x 6-inch case which can be mounted on any flat surface.

More

Literature

(Continued from page 25)

Twin Disc Model PO Air-Actuated Clutch. (Bulletin 304) Describes performance characteristics. Offers ready answer for both replacement on old installations and design into new installations on presses and brakes, paper mill drives and other types of heavy industrial equipment. Twin Disc Clutch Co., Racine, Wis.

Water Jet Eductors. (Bulletin 2-M) Includes comprehensive information on design, construction, application and operation, as well as methods of pumping and moving liquids and handling solids with SK eductors. Also provides section to enable reader to determine whether or not a special SK Eductor might be applicable where a standard eductor will not do the job. Widely used in lifting, pumping, mixing and agitating of liquids and in handling of solids and slurries. Schutte and Koerting Co., Cornwells Heights, Bucks County, Pa.

Wood's V-Belt Drive Manual. (Catalogue) For use by design, purchasing, production and maintenance departments. T. B. Wood's Sons Co., 1300 Fifth Ave., Chambersburg, Pa.

Wire Stitching. (Bulletin AD 131) Covers the subject of wire stitching corrugated and solid fiber boxes and the machines used in this fastening process. Complete specifications and dimensions are included. Acme Steel Co., 2840 Archer Avenue, Chicago 8, Ill.

Yale Hand Lift Pallet Trucks. (Brochure P-673B) Provides photographs of actual applications, cutaway photographs showing operation of both hydraulic and mechanical lifting mechanisms and a section describing different pallet types and designs with specifications. Yale Materials Handling Div., Yale & Towne Mfg. Co., 11,000 Roosevelt Boulevard, Philadelphia 15, Pa.

For Complete Fire Protection. (Catalogue L-154) Includes specifications for centrifugal fire pumps, booster pumps and tank filling pumps; also diagrams of typical fire pump installations. Economy Pumps, Inc., Div. of C. H. Wheeler Mfg. Co., 19th & Sedgley Avenue, Philadelphia 32, Pa.

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(Production as percent of normal capacity)

COMPARATIVE WEEKLY SUMMARIES

1954	Aug. 21 94.6	Aug. 28 90.3	Sept. 4 91.9	Sept. 11 73.4r	Sept. 18 93.2
1953	Aug. 22 96.0	Aug. 29 95.9	Sept. 5 94.8	Sept. 12 76.6	Sept. 19 97.2

r Revised.

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1953	94.5	94.6	94.4	92.7	93.9	93.8	82.2	94.7	92.7	97.2	94.6	82.8	92.3
1954	93.3	94.0	93.1	92.2	93.7	89.3	81.1‡	92.6‡					

‡ Preliminary.

COMPARATIVE YEARLY SUMMARIES

	1947	1948	1949	1950	1951	1952	1953	1954
Year to Date	103.4	96.8	86.0	95.1	99.2	90.4	92.6	91.2
Year Average	101.7	92.1	83.7	95.8	98.0	88.6	92.3	

PAPERBOARD OPERATING RATIOS†

1954	Aug. 21 92	Aug. 28 92	Sept. 4 91	Sept. 11 70	Sept. 18 93
1953	Aug. 22 97	Aug. 29 98	Sept. 5 98	Sept. 12 76	Sept. 19 100

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1953	91	95	95	95	96	93	81	98	94	97	94	79	93
1954	89	89	90	88	90	89	74	92					

All of the above data is based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint Exclusively.

Note: In the above tables *all* the ratios shown are on the basis of a normal 6 and 7 day capacity.

† Per cents of operation based on "Inch-Hours" reported on a 6-day basis to the National Paperboard Association.

pioneer paper stock company graders and packers of waste paper

More People

(Continued from page 12)

he was appointed assistant superintendent. He saw half of the new papermaking machinery installed that year, the rest in 1919.

Mr. Lane became successively assistant general superintendent of the paper division, assistant to the Kodak Park general manager, assistant manager, and assistant general manager of Kodak Park.

Shawano Promotes Three Executives

Shawano Paper Mills, Shawano, Wis. has promoted Jesse H. Trask to vice-president in charge of manufacturing. Mr. Trask has been resident manager at Shawano for the past four years.

Robert L. Leaf, Jr. has been promoted to vice-president in charge of development. Mr. Leaf has been with the company for the past four years and formerly was resident manager of the company's pulpmill at Little Rapids, Wis.

Donald W. Loeffler has been promoted to treasurer. He has been assistant treasurer of the company for the past year.

All of these promotions are effective immediately.

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1—126" #18 Cameron Rewinder with constant tension unwind.

1—7-roll 144" heavy duty Black - Clawson calender stack.

1—50" #8E Hudson Sharp Embosser.

2—#3-A100 Bird screens.

2—144" 8-roll Holyoke super calender stacks.

1—Sandy Hill enclosed hypoid drive 2.95 to 1 ratio. (Like new.

1—8" Shartle disintegrator pump

2—36" horizontal Dilts classifiners

1—62" 4-roll Calender

1—132" 7-roll Black-Clawson Calender, box frames

1—144" 7-roll Black-Clawson Calender, box frames

1—152" 9-roll Farrel-Birmingham Calender, box frames

1—158" 7-roll Beloit Calender, box frames

1—80" single Horne cutter with layboy

1—104" Beloit duplex cutter

1—118" Downingtown duplex cutter

1—Taylor-Stiles giant rag cutter

19—42" x 138" Beloit bolted head dryers

9—48" x 106" Moore & White bolted head dryers

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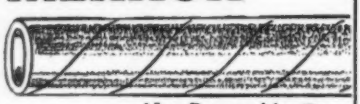
Non-Returnable, Durable standard mill core.

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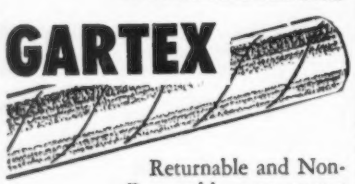

Returnable and Non-Returnable extra strong mill core for regular and special needs.

MADE TO YOUR SPECIFICATIONS
Write for samples and prices
MERCER
PAPER TUBE, INC.
655 WEST INGHAM AVE.
TRENTON, NEW JERSEY
Sales Offices:
NEW YORK OFFICE, 500 5TH AVE.
PHILA., PA., PHONE MARKET 7-3313
J. E. FRICKE CO.

It will speed the reply to your inquiry to mention Paper Trade Journal.

PRICES

MARKET WOOD PULP

Fourth Quarter Contract Prices Per Short Air-Dry Ton

	Delivered Basis		Varying Freight Allowances†		
	U.S.	Canadian	Swedish	Finnish	Norwegian
Groundwood	$75.00/$80.00	‡$60.00/$95.00*	§$78.00/$85.00§	§$80.00/ —	§$77.50/$80.00
Kraft, Bleached	142.50/147.50	145.00/150.00	$142.50/ —		$142.50/ —
Kraft, Blchd. Hdwd.	140.00/ —		$130.00/ —		
Kraft, Semi-bleached	130.00/132.50	130.00/ —	$132.50/135.00§	132.50/137.50*	
Kraft, Unbl.	95.00/105.00	105.00/135.00	*105.00/110.00*	*105.00/135.00*	
Sulphite, Blchd.	140.00/ —	140.00/ —	$137.50/140.00†	140.00/ — *	$135.00/142.50*§
Sulphite, Unblchd.	120.00/ —	120.00/ —	$114.00/125.00†	120.00/125.00*	
Sulphite, Unbl. Gl'sn.		124.00/ —	†125.00/ —		
Soda, Blchd.	140.00/ —				

‡ F.o.b. Shipping Point. § On Dock Atlantic Ports. * Freight allowed.

RAG MARKET

New Domestic Cotton Cuttings
Delivered Mill Basis

	Per 100 lbs.
No. 1 White Shirts	$13.50/$14.00
No. 1 Unblchd. Muslins	16.25/ 16.75
Blchd. & Unblchd. Underwears	nominal
No. 1 Light Silesias	7.50/ 8.00
No. 1 Blue Overalls	7.25/ 7.50
Percales	6.00/ 6.50
No. 1 Light Prints	5.50/ 6.00
Suntan Khakis	6.00/ 6.25
Cottonades	3.75/ 4.00
No. 1 Washables	3.00/ 3.25

Old Domestic Cotton Rags
(Prices to Dealers, F.o.b. Ship. Pt.)

	Per 100 lbs.
Mixed White	$2.75/$3.00
Cotton Pants & Overalls	2.00/ 2.25
Thirds and Blues, Repacked	1.65/ 1.75
No. 2 Roofing Rags	nominal

COTTON LINTERS

Memphis Market
F.o.b. Oilmills

	Sept. 21 Per 100 lbs.
Grade 1	n.a.
2	$9.50/ $7.25
3 1st cut—felting	6.75/ 5.75
4	5.25/ 4.25
5	4.00/ 3.00
6 *2nd cut—chemical	3.00/ 3.00
7	3.00/ 3.00

*Based on 73% cellulose.

Bagging
(Prices to Dealers, F.o.b. N. Y.)

	Per 100 lbs.
Foreign Gunny	$3.75/$4.50
Foreign Scrap Burlap	3.00/ 3.75
Heavy Wool Tares	4.00/ 4.25
Austr. Wool Pouches	4.00/ 4.50
Domestic Manila Rope	4.50/ 5.00
Domestic No. 1 Sisal Strings	5.00/ 5.25

WASTE PAPER MARKET

Mill Prices, F.o.b. Car Shipping Point - Includes Brokerage

These quotations are a partial indication of the price range on volume tonnage in each market on the date specified, as gathered from major dealers. SPECIAL PACKINGS AND SPOT TONNAGE NOT INCLUDED. Prices nominal. See TRENDS.

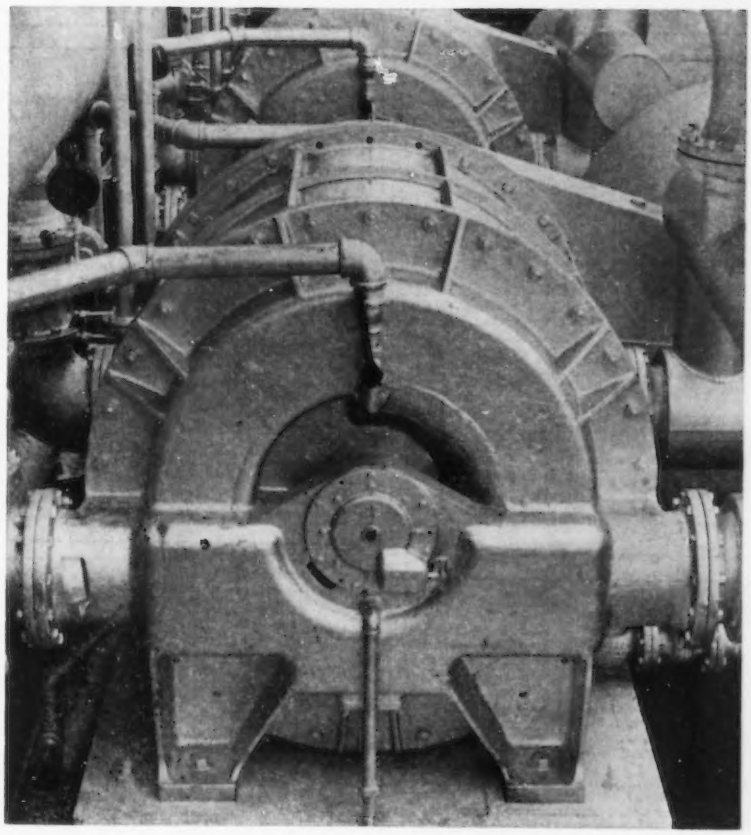
	New York	Boston	Chicago	Los Angeles
	Sept. 27	Sept. 25	Sept. 2	Sept. 7
No. 1 Mixed Paper	$ 8.00/ 11.00	$ — / 10.00	$11.00/ —	$14.00/ —
No. 1 News	13.00/ 15.00	12.00/ 14.00	15.00/ —	13.00/ —
Overissue News	18.00/ 23.00	17.00/ 20.00	18.00/ 20.00	13.00/ —
Mill Wrappers	13.00/ 19.00	12.00/ 14.00	14.00/ —	13.00/ —
Old Corrugated Containers	19.00/ 24.00	19.00/ 20.00	22.00/ —	20.00/ —
Super Resorted Kraft Paper	45.00/ 50.00	50.00/ 60.00	40.00/ —	45.00/ —
New Double Kr. Ld. Corr. Cuts	42.50/ 47.50	42.50/ 47.50	42.50/ 47.50	35.00/ 45.00
New 100% Kraft Corr. Cuts	55.00/ 65.00	55.00/ 65.00	60.00/ —	— / —
New Br. Kraft Env. Cuts	75.00/ 85.00	65.00/ 78.00	65.00/ —	45.00/ 50.00
New Br. Kr. Bag Waste Prntd.	55.00/ 60.00	50.00/ 60.00	55.00/ —	45.00/ 50.00
New Br. Kr. Bag Waste Unprntd	70.00/ 80.00	63.00/ 65.00	65.00/ 70.00	— / —
No. 1 Groundwood Shvs.	25.00/ 30.00	25.00/ 30.00	20.00/ 25.00	27.00/ 35.00
White Newsblanks	60.00/ 70.00	60.00/ 65.00	45.00/ —	55.00/ —
No. 1 Soft Wht. Shvs., coated	65.00/ 80.00	70.00/ 80.00	65.00/ —	— / —
Hd. Wht. Shvs.	105.00/110.00	95.00/110.00	100.00/ —	95.00/ —
Hd. Wht. Env. Cuts	125.00/130.00	110.00/130.00	105.00/ —	105.00/ —
Col. Tab. Cards	50.00/ 60.00	— / 60.00	50.00/ —	28.00/ 35.00
Manila Tab. Cards, bales	80.00/ 85.00	80.00/ 90.00	80.00/ —	64.00/ — §
No. 1 Col. Ledger	40.00/ 42.50	40.00/ 50.00	42.50/ —	27.50/ —
White Ledger	57.50/ 65.00	65.00/ 68.00	55.00/ —	45.00/ —
Mixed Book & Mag.†	18.00/ 20.00	18.00/ 22.50	12.50/ —	— / —
No. 1 Rep'd. Hvy. Books ‡	27.00/ 30.00	25.00/ 35.00	25.00/ —	7.00/ 10.00

† Includes Time & Life; no coarse groundwood. ‡ Not to exceed 10% groundwood. § Deld.

PRICES OF MATERIALS

Aluminum sulphate:			
cml. bags, c.l. wks.	cwt.	$1.85	/ —
iron-free, c.l. wks.	cwt.	3.55	/ —
Casein, acid prec.:			
dom. sh. pt. cl.	lb.	.27	/ .32
Arg. ex. dock, duty paid		.22½	/ .23
New Zeal, do.		.25	/ .26
Caustic soda:			
c.l. wks. solid, 76%	cwt.	3.85	/ —
flak. & grd. 400-lb. drums, c.l.		4.25	/ —
liquid 50% tanks		2.70	/ —
liquid 70% tanks		2.80	/ —
China clay:			
dom. air-float, c.l. wks.	ton	10.00	
water-washed, lump, filler	ton	11.00	
coating	ton	17.60	/30.50
Imported, ex. ship	short ton	16.00	/30.00
Chlorine:			
single-unit tanks, works	cwt.	2.93	/ —
multiple unit, 2-5 cars per yr.		3.83	/ 5.00
Formaldehyde:			
USP, inh. dms. c.l. wks.	lb.	.0666	/ —
l.c.l., E. wks.	lb.	.071	/ —
Lime:			
hydrated bags, wks.	tons	14.50	/15.50
Gum rosin:			
K, M, N, drms, c.l. Savan,	cwt.	7.63	/ 7.70
Rosin size:			
70%, gum & pale grds., tank cars, south, sh. pt.	cwt.	6.55	/ 6.70
Salt cake:			
dom. bulk, 100% anh. wks	ton	24.00	/26.00
imp. f.o.b. Saskatchewan	ton	16.00	/ {Cana. funds
Soda ash:			
light, 58%, bags, wks	cwt.	1.65	
bulk	cwt.	1.35	
Sodium silicate, 40° Be.:			
tank-cars, wks.	cwt.	1.00	/ —
drums, c.l. wks.	cwt.	1.35	/ —
42° Be. WW.			
tank-cars, wks.	cwt.	1.60	/ —
drums, c.l. wks.	cwt.	1.95	/ —
Sodium peroxide:			
dms. c.l. E. of Miss.	lb.	.186	
l.c.l. do	lb.	.191	/ .201
Soybean, protein:			
chem. isol., wks. c.l. bags.	lb.	.25	/ .25½
Sulphuric acid:			
60° Be. chys. c.l. wks.	cwt.	1.75	/ 2.00
l.c.l. wks.	cwt.	2.30	/ 2.45
tank-cars, wks.	ton	16.30	/18.60
Sulphur:			
crude, c.l. mines, contract,	long ton	25.50	/27.50
f.o.b. vessels Gulf	do.	27.50	/30.50
Sulphur dioxide:			
liquid, coml. cyl., wks.	lb.	.09	
multi-unit cars	lb.	.0535	
Starches:			
corn, multiwalls, c.l. prod. plant:			
pearl	cwt.	6.39	/ —
white, dextrines	cwt.	7.78	/ —
chlorinated	cwt.	8.14	/ —
potato, Idaho, c.l. wks.	cwt.	6.75	/ —
East, fr. all. 50 cents cwt.			
potato, Maine, f.o.b. wks.	cwt.	{Nominal 7.25	/ —
Talc:			
domestic, sacks, c.l. wks.	ton	25.00	/30.00
Titanium dioxide:			
anatase, c.l. deld. E. bags	lb.	.22½	/ .23
l.c.l. deld.	lb.	.23½	/ .24
rutile, c.l. deld.	lb.	.24½	/ .25
l.c. deld.	lb.	.25½	/ .26

High machine speeds? High temperature headbox stock? You need NASH Vacuum Pumps!



Air from the suction rolls on paper machines carries with it substantial quantities of moisture. This considerably reduces the effective air handling capacity of any vacuum pump except the Nash. In the Nash Vacuum Pump, because of the unique principle of operation, the bulk of this vapor is effectively condensed inside the pump. The total capacity of a Nash is therefore increased.

When you specify a Nash Pump it can be closely sized to the job. It is not necessary to select an over-sized unit, because the rated capacity of the Nash may be relied upon.

That is one of the reasons why Nash Vacuum Pumps are installed in over a thousand leading Paper Mills. An engineer from Nash will be glad to survey your mill, and make recommendations, entirely without obligation to you.

NASH ENGINEERING COMPANY

441 WILSON ROAD, SO. NORWALK, CONN.

PAPER TRADE JOURNAL CLEARING HOUSE PAPER TRADE JOURNAL

RATES FOR ADVERTISING (PAYABLE IN ADVANCE) $.75 cents per line (6 words to line) minimum charge $3.75 —Additional charge of 70 cents if box number is used

Situation wanted advertisements can be repeated for ½ rate

Space in this section can also be purchased at $5.00 per column inch—(1" x 2¼)

Address replies to advertisements appearing under Box Number in care of PAPER TRADE JOURNAL, 15 West 47th Street, New York 36, N. Y.

HELP WANTED

POSITIONS OPEN

We can place—Two board mill supts., one for Canada and one for United States; coating supts.; technical directors and men to head up quality control.

Finishing foremen (2); Fourdrinier and Cylinder mach. tour bosses on fine papers, also board; boss machine tender wide fast running newsprint machine, attractive salary.

Chemists and chem. directors (several); designers, draftsmen, master mechanics and plant engineers; chief development engineer for firm building paper machinery; technical graduates for mechanical, chemical, industrial, electrical and civil engineering; board and paper salesmen.

If you are available for a position in paper or pulp mfg. or paper converting, SEND US YOUR RESUME. It will be in confidence. No charge unless you accept employment through our Service.

CHARLES P. RAYMOND SERVICE, Inc.
Phone: LIberty 2-6547
294 Washington St., Boston 8, Mass.
O-1

CHEMIST OR CHEMICAL ENGINEER

Opportunity available for Chemist or Chemical Engineer in an expanding pulp and paper mill located in the Middle Atlantic States. Age 25-35 years with several years experience in pulp and paper chemicals and fibers. Good salary with excellent opportunity for advancement. Send resume of educational background and industrial experience. All replies confidential. Address Box 54-338 care Paper Trade Journal.
N-19

SALARIED POSITIONS $5,000 to $35,000. We offer the original personal employment service (established 44 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. BIXBY, INC. 663 Brisbane Bldg., Buffalo 3, N. Y.
O-1

DEVELOPMENT ENGINEER WANTED

Graduate Engineer with substantial paper mill machinery experience—to head newly organized Development Dept. under Vice President. Established New England machinery manufacturer. Give detailed resume of experience. Reply Box 54-332 c/o Paper Trade Journal.
O-1

HELP WANTED

TECHNICAL SERVICE DIRECTOR

Excellent opportunity for Technical Service Director in a large progressive pulp and paper mill located in the Middle Atlantic States.

Prefer Ph.D. or M.S. in Chemistry or Chemical Engineering. Candidates must be at least 35 years of age, possess administrative potentialities and have industrial experience in the field of pulp, paper, coatings, quality control and other related problems.

Will be expected to assume full responsibility for the management of the Technical Services Division and conduct programs in Product Improvement and development, process and Equipment studies and train young technical graduates in phases of pulp preparation and paper making.

Remuneration will be commensurate with qualifications. Liberal company benefits. Replies held in strictest confidence. Address Box 54-328 care Paper Trade Journal.
N-5

PULP MILL SUPERINTENDENT

Wanted for 600 ton Kraft Pulp Mill in paperboard plant. Must be competent and experienced. Salary open. This position is with a large company and is a real opportunity for a capable person. Address: Box 54-317 care Paper Trade Journal.
O-1

WANTED SUPERINTENDENT. An excellent opportunity for a keen, energetic man to join the staff of fine paper mill currently making rag content papers for commercial, Government and technical purposes. Successful applicant will act as Assistant Superintendent for a period and when ability proven, promotion will follow. Remuneration commensurate with experience. Applications, which will be treated in strictest confidence, should be addressed to Box 54-292 care Paper Trade Journal. O-8

WANTED MACHINE TENDER. Experienced Machine Tender required for fine paper mill making rag content papers. Only men capable of taking full charge of machine and its operation should apply to Box 54-294 care Paper Trade Journal. O-8

HELP WANTED

Project Engineer

Midwest engineering and construction company seeking graduate mechanical or chemical engineer with several years mechanical engineering experience. Must have recent experience in supervising the design of pulp and paper producing facilities. Position involves coordination of design, assistance in sales pertaining to engineering services and the maintaining of good client relationships.

Position offers long-term employment with attractive salary, paid vacation and holidays, sick leave allowance and company-sponsored group insurance program.

If you feel your background qualifies you for this position please submit complete resume showing experience, education and salary requirements. All replies will be treated confidential. Interviews arranged with qualified applicants. Address Box 54-333 care Paper Trade Journal.
O-15

WANTED—Superintendent Sanitary Tissue Converting Plant in Venezuela, S. A. Able to operate, repair, maintain machines and teach others. Wages open, based on experience. You must give all particulars in your reply to De Sola Bros., Inc., 111 Wall Street, New York. O-15

DESIGN ENGINEER

Permanent position to be filled immediately. Degree in Mechanical or Civil Engineering, minimum of five-years experience in paper or allied industry required. Duties include drafting, design, cost estimating, and general engineering field work. Salaried position with provision for periodic merit review. Liberal benefit program established. Submit resume of qualifications and experience to:

Section "E", Industrial Relations Department
Bowaters Southern Paper Corporation
Calhoun, Tennessee O-1

WANTED—Mechanical Engineer, 25 to 35, to be assistant to Production Manager of small specialty paper mill in New England. Some experience as manufacturing or maintenance supervisor desirable. Forward complete resume of personal history, education and experience with introductory letter to Box 54-319 care Paper Trade Journal. O-1

EXECUTIVE WANTED—We have opportunity for top quality paper mill superintendent for three machine mill, two Cylinders and one Fourdrinier. Excellent plant location. Experience needed for white patent coated bleached manila, all other folding grades, test liner, corrugated medium and light weight chip. Salary $15,000. Telephone, telegraph or write in confidence to—

CHARLES P. RAYMOND SERVICE, Inc.

Phone: LIberty 2-6547 — 294 Washington St. — Boston 8, Mass.

O-8

FOR SALE | FOR SALE | FOR SALE

1—106" Trim Cameron Slitter, Type 18. Anti friction bearings throughout. 42" diameter rewind. 2500 F.P.M.

FOR SALE

BARKING DRUM
1—10' x 30'.

BEATERS
2—1500 lb. Dilts iron tub beaters, rolls 52" diameter x 42" face.
1—Noble & Wood Beater roll and stand. 70" diameter x 44" face.
2—Breaker Beaters—52" diameter x 48" face rolls.
2—1500 lb. rag beaters, Valley Iron, bandless rolls, 54" x 48", cast iron tubs, with motors.
Write us regarding your requirements.

BREAKER STACK
1—110" face 2 roll breaker stack, with frames.

CALENDER STACKS
1—3 roll 30" face friction Calender Stack (Holyoke), 2 iron rolls, 1 cotton roll and 1 spare cotton roll.
1—4 roll 72" Calender Stack. (Extra heavy duty).
1—3 roll 60" Friction Calender Stack, Two iron rolls and 1 Paper or Cotton Roll.
1—5 Roll 86".
1—5 Roll 90".
1—9 Roll—86" face, Super Calender Stack.

CHIPPERS
1—96" Murray 6 knife chipper, complete with 300 H.P. synchronous motor.
1—88" Carthage 4 knife Chipper.
1—96" Murray 4 knife Chipper—anti-friction bearings.
1—84" Carthage 4 knife Chipper.

CLASSIFINER
1—Dilts Classifiner, practically new, with motor.

CORE MACHINES
1—Dietz Core Machine (Tube Winder).

CRUSHER & HAMMERMILL
1—Murray Chip Crusher.

CYLINDER MOULDS
2—30" diameter x 72" face.
1—30" diameter x 92" face.
2—36" diameter x 54" face.
2—36" diameter x 84" face.
2—36" diameter x 86" face, with vats.
6—36" diameter x 110" face, with 24" diameter couch rolls.
1—48" diameter x 117" face.
2—36" diameter x 136" face with anti-friction bearings.

DIGESTERS
2—14' Globe Rotary Digesters.

DRIVES
1—Jones Reducer 75 h.p.—30.8 to 1.
1—Jones 21—H.P., ratio 10 to 1.
1—#4 Reeves Drive.
1—Vaughn 100 H.P. enclosed drive Ratio 7 to 1.
2—Cleveland agitator drives, for chests.
2—Waterbury Hydraulic Variable speed line shaft drives (from 40 to 100 h.p.).

DRYERS
10—36" diameter x 84" face, with gears & bearings.
1—48" diameter x 96" face (Jacketed Lukens type) w.p. 80 lbs.
12—48" diameter x 144" face.
4—48" diameter x 132" face.
1—Complete unit, consisting of 6 dryers, 36" diameter x 38" face, including frames, gears, anti-friction bearings.
5—24" diameter x 54" face, with bearings.
1—28" diameter x 48" face.
5—28" diameter x 80" face with anti-friction bearing.
8—36" diameter x 44" face.
1—36" diameter x 67" face.
2—36" diameter x 72" face.
60—36" diameter x 73" face, gears and bearings.
6—36" diameter x 76" face.
1—36" diameter x 90" face.
2—36" diameter x 120" face.
1—48" diameter x 70" face.
2—48" diameter x 88" face. Frames, gears, bearings and felt equipment.
1—48" diameter x 100" face.
1—48" diameter x 106" face.
2—Dryers 48" diameter x 134" face.
1—48" diameter x 144" face.
3—60" diameter x 86" face.

EMBOSSING CALENDERS
1—15" 2 roll embosser.

EXTRACTOR ROLLS
1—Extractor roll, 26" diameter x 104" face, with rubber couch roll.
1—Rice, Barton & Fales Extractor Roll, 26" diameter x 104" face, with rubber couch roll.

FLAT SCREENS
2—12 plate Flat Screens.
2—14 plate Packer, roller shoes.
1—14 plate flat screen, Packer, roller shoes with scraping device, practically new screen.

GEARS
Write us regarding your requirements.

GRINDERS
2—4 pocket Grinders.
2—3 pocket Grinders.

HEAD BOX & INLET
1—Valley Iron Works Inlet complete with head box. 156", all stainless steel.

HYDRAFINER
1—Dilts Hydrafiner with motor.

JORDANS
1—#2 Emerson anti-friction bearing.
1—#1 Emerson, iron plug, new spare filling.

LABORATORY EQUIPMENT
Write us regarding your requirements.

LAMINATING MACHINE
1—72" Hudson Sharp laminating machine, reverse coater.

MISCELLANEOUS
1—2 ton Philadelphia Chain Block.

MOTORS
2—150 H.P. Westinghouse 495 R.P.M. 3/60/440, with starter.
1—50 H.P. Upright motors, air cooled 3/60/440, 1150 R.P.M. (Ball Bearing).
Write us regarding your requirements.

PRESSES
Write us regarding your requirements.

PULLEYS
Various cone and assorted pulleys.

PULPERS
1—Jones Pulper.

PUMPS
5—Shartle Bros. Agiflow circulating pumps.
Various sizes of Centrifugal and Plunger Pumps. Write us regarding your particular requirements.

RAG CUTTERS
Write us regarding your requirements.

REELS
1—86" 2 bowl reel.
1—84" 3 bowl revolving reel.
1—123"—3 bowl revolving reel.
1—134"—2 drum.
1—72" Downingtown Reel, 2 bowl.

REFINERS
1—12" Wiener Refiner.

ROLL HEADING MACHINE
1—Montague header, with air cylinders, heating element, etc., for up to 36" diameter by 82" long roll.

ROLLS
1—Rubber Couch Roll—20" diameter x 108" face.
5—Rubber Couch Rolls—24" diameter x 110" face.
Felt, Table, Press, Breast, Couch, etc. Various sizes and types. (Bronze, Rubber, Iron, etc.)

ROTARY SCREENS
1—Bird, 36" diameter cylinder x 50" long plate, enclosed drive.
Write us regarding your requirements.

SAVEALLS
4—Thompson Washers 36" x 110" cylinder, molds, 24" diameter rubber couch rolls.
2—Savealls 36" diameter x 136" face, hollow shaft cylinder molds, anti-friction bearings, iron end vats. Very good condition.
2—Sandy Hill, 36" diameter x 86" face cylinder molds, anti-friction bearings and couch rolls.

SCREEN PLATES
Write us regarding your requirements.

SHAKER ROLLS
1—134" face x 14" diameter with Messenger bearings.
1—104" face x 14" diameter with Messenger bearings.

SHEETERS
1— 72" Hamblet Sheeter.
1—140" Hamblet (Simplex).
1—140" Hamblet (Duplex).

SHOWERS
5—Bird showers 96" face.

SHREDDER
1—#5 Taylor Stiles "Giant" Pulp Shredder.

SLITTERS & WINDERS
1—32" Cameron—Type 24-3A.
1—36" Cameron—Type 44-W (Winder only.)
2—42" Cameron—Type 6.
1—42" Cameron—Type 24-2A.
1—50" Cameron—Type 6.
1—50" Cameron Type 24-2AL.
1—56" Cameron—Type 24-2A.
1—62" Cameron—Type 10.
1—62" Cameron—Type 40-1-AF.
1—62" Cameron (duplex)
1—72" Cameron—Type 10.
1—92" Cameron—Type 12.
1—106" Cameron—Type 18.
2—86" Two Drum Moore & White, 50" diameter rewind.
1—104" Beloit two drum winder.
1—108" Sandy Hill winder.
1—120" Moore & White, 4 drum winder.

STOCK PUMPS
1— 8 x 18 Shartle Triplex.
2—10 x 10 Beloit Duplex, low type.
2—10 x 20 Shartle Triplex.
1—12 x 20 Shartle Triplex.
Advise as to your requirements.

SUCTION BOXES
Write us concerning your requirements.

SUCTION PRESS ROLLS
1—Sandusky Suction Press Roll 130" drilled face x 14 3/8" diameter.
1—Sandusky Suction Press Roll, 162" drilled face x 22" diameter with roller bearings.
1—Sandusky suction press roll, 14 3/8" x 106" drilled face, complete, including brass top roll (also spare shell, like new).

TABLE ROLLS
9—154" face x 5" diameter (Brass)
8—148" face x 5" diameter (Brass)
10—150" face x 5" diameter (Aluminum)
Write us regarding your requirements.

THICKENERS
1—Sandy Hill Thickener, all Stainless Steel, mold 60" x 101" face, with couch roll. Anti-friction bearings throughout.
1—Pulp Thickener, cylinder mold 48" x 117", with spare cylinder mold.

TOILET WINDERS
2—72" Hudson-Sharp (Surface type winder).
4—81" Dietz.

TRIMMERS
1—63" Oswego cutter.
1—60" Guillotine cutter.

VACUUM PUMPS
2—#3 Nash Hytor.
3—#4 Nash Hytor.
1—H7 Nash Vacuum Pump.
1—#8 Nash Hytor.
1—#9 Nash Hytor.
1—N-82 Nash, for Fulton-Midwest System

VIBRATING SCREEN
1—Tyler Niagara Vibrating Screen, practically new.

WAXING MACHINE
1—65" Mayer Waxing Machine.

WET MACHINE
1—72" Wet Machine.

YANKEE DRYERS
1—106" x 72" diameter.

Paddy Ross, Pres.
J. J. ROSS COMPANY
Ben Kurs, Treas.
377 Frelinghuysen Ave.* Tel.—Bigelow 3-3720 Newark 5, N. J.

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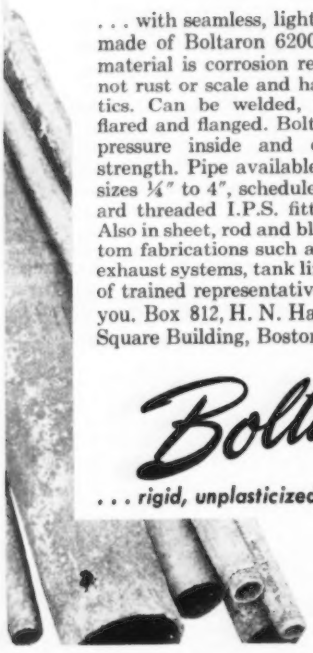

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E CELLULOSE ACETATE STAPLE YARN	6%	230° F	50 grams	10 min.
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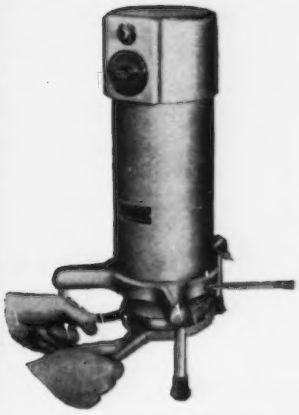

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DECKLE WEBBING
Williams-Gray Co.

DEFOAMERS
Arnold Hoffman & Co., Inc.
Hercules Powder Co.
Houghton & Co.

DEINKING
Bird Machine Co.
Dilts Machine Works
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

DEINKING CHEMICALS
Antara Chemicals Division, General Dyestuff Corp.
E. I. du Pont de Nemours & Co., Inc.
Nopco Chemical Co.

DE-MINERALIZING EQUIPMENT
Hungerford & Terry, Inc.
Permutit Company

DENSOMETERS
Testing Machines, Inc.
W. & L. E. Gurley

DESIGN CONSTRUCTION
Ebasco Services

DETERGENTS
American Cyanamid Company, Industrial Chemicals Division
Antara Chemicals Division, General Dyestuffs Corp.
Arnold, Hoffman & Co., Inc.
Calgon, Inc.
Diamond Alkali Co.
Monsanto Chemical Company
Nopco Chemical Co.
Rohm & Haas Company
Wyandotte Chemicals Corp., Michigan Alkali Div.

DEWAXING CHEMICALS
American Cyanamid Company, Industrial Chemicals Division
Antara Chemicals Division, General Dyestuffs Corp.
Arnold, Hoffman & Co., Inc.
Nopco Chemical Co.

DIGESTER CIRCULATING SYSTEMS
Sandy Hill Iron & Brass Works

DIGESTERS
Babcock & Wilcox Co.
Bauer Bros. Co.
Blaw Knox Company
Chicago Bridge & Iron Co.
Graver Tank Mfg. Co.
Pandia, Inc.
Pusey & Jones Corp.
A. O. Smith Corp.

DISPERSING AGENTS
Antara Chemicals Division, General Dyestuffs Corp.
Arnold, Hoffman & Co., Inc.
Calgon, Inc.
Diamond Alkali Co.
Monsanto Chemical Company
National Aluminate Corp.
Nopco Chemical Co.
Rohm & Haas Company
Wyandotte Chemicals Corp., Michigan Alkali Div.

DOCTORS
The Bagley & Sewall Company
Bird Machine Company
Black Clawson Company
Downingtown Mfg. Co.
Lobdell United Co.
Lodding Engineering Corp.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

DOCTOR BLADES
The Bagley & Sewall Company
Bird Machine Company
Black Clawson Company
John W. Bolton & Sons, Inc.
Lodding Engineering Corp.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Simonds Saw & Steel Co.
Westinghouse Electric Corp.

DOCTOR OSCILLATORS
Ronningen-Petter Co.

DRIERS
The Bagley & Sewall Company
Beloit Iron Works
Black Clawson Company
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
Lukenweld
Mahon, R. C., Co.
Moore & White Co.
Murray Mfg. Co., D. J.
J. J. Ross Company
Red-Ray Mfg. Co., Inc.
Ross Paper Machy. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

DRIERS—LABORATORY
Testing Machines, Inc.

DRILLED SUCTION COUCH ROLLS
Downingtown Mfg. Co.
Manchester Machine Co.
Ross Paper Machinery Co.

DRILLED SUCTION DRUM ROLLS
Downingtown Mfg. Co.
Manchester Machine Co.
Ross Paper Machinery Co.

DRIVES
Allis Chalmers Mfg. Co.
Appleton Machine Co.
The Bagley & Sewall Company
Beloit Iron Works
Bird Machine Co.
Black Clawson Company
Dodge Mfg. Corp.
Downingtown Mfg. Co.
Farrel-Birmingham Co.
General Electric Company
Gibbs-Brower Company, Inc.
Horton Mfg. Co.
Jeffrey Mfg. Co.
Link Belt Co.
Manchester Machine Co.
Moore & White Co.
Murray, D. J., Mfg. Co.
Pusey & Jones Corp.
J. J. Ross Company
Ross Paper Machy. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

DRUM WINDERS
Black Clawson Company
Downingtown Mfg. Co.
Manchester Machine Co.
Ross Paper Machinery Co.

DRYER ROLL PYROMETER
Ross-Midwest Fulton Corp.
Testing Machines, Inc.

DUSTERS
Appleton Machine Co.
Frank W. Egan & Co.
M. W. Jenkins Sons, Inc.
E. D. Jones & Son Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Waldron, John, Corp.

DUSTING BRUSHES
M. W. Jenkins Sons, Inc.

DYESTUFFS
Ciba Company
E. I. du Pont de Nemours & Co., Inc.
Geigy Co., The
General Dyestuffs Corp.

ELECTRIC HYDROMETER
Testing Machines, Inc.

ELECTRICAL PRECIPITATORS
Research Corporation

EMBOSSING MACHINES
Dilts Machine Works
Egan, Frank W., & Co.
Hudson Sharp Machine Co.
Paper Converting Machine Co.
Potdevin Machine Co.
John Waldron Corp.

EMBOSSING ROLLS
The Appleton Machine Co.
Gibbs-Brower Company, Inc.
Holyoke Machine Co.
Hudson Sharp Machine Co.
B. F. Perkins & Son, Inc.
Stone, Thos. & Geo. M., Inc.
John Waldron Corp.

EMPLOYMENT SERVICE
Bixby, R. W., Inc.
Raymond, Chas. P., Service, Inc.

EMULSIFIERS
Antara Chemicals Division, General Dyestuffs Corp.
Arnold, Hoffman & Co., Inc.
Nopco Chemical Co.
Rohm & Haas Company
Wyandotte Chemicals Corp.

ENZYMES
Rohm & Haas Company
Vanderbilt Co., R. T.

EVAPORATORS
Murray, D. J., Mfg. Co.
Swenson Evaporator Co., Div. of Whiting Corp.
Westinghouse Electric Corp.

EXPANDERS
Mount Hope Machinery Co.

FABRICATORS
R. C. Mahon Co.
Ronningen-Petter Co.

FANS
Buffalo Pumps, Inc.
General Electric Co.
B. F. Perkins & Son, Inc., Roots-Connersville Div.
Ross Engineering Co., J. O.
Westinghouse Electric Corp.

FEEDERS
Jeffrey Mfg. Co.
Merrick Scale Mfg. Co.
Permutit Company

FELTS
Albany Felt Co.
Appleton Woolen Mills
Asten-Hill Mfg. Co.
Draper Bros. Corp.
Huyck & Son, F. C.
Knox Woolen Company
Lockport Felt Co.
Shuler & Benninghofen
Waterbury Felt Co.
Williams-Gray Co.

FELT CLEANERS
Antara Chemicals Division, General Dyestuffs Corp.
Calgon, Inc.
Nopco Chemical Co.

FELT CONDITIONERS
Bird Machine Co.
Downingtown Mfg. Co.
Mount Hope Machinery Co.
The Sandy Hill Iron & Brass Works

FELT EXPANDERS
Mount Hope Machinery Co.

FELT GUIDES
Beloit Iron Works
Black Clawson Company
Downingtown Mfg. Co.
Frank W. Egan & Co.
Gilbert & Nash Co.
Moore & White Co.
Mount Hope Machinery Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron Corp., John

FELT PRESERVERS
Mount Hope Machinery Co.

FELT SHOWERS
Ronningen-Petter Co.

FIBRE BOARD MACHINES
Black Clawson Company
Sandy Hill Iron & Brass Works

FIBRE GLASS
Pittsburgh Plate Glass Co.

FILLERS
American Cyanamid Company, Industrial Chemicals Division
J. M. Huber Corp.
Thiele Kaolin Co.
Vanderbilt Co., R. T.
Wyandotte Chemicals Corp., Michigan Alkali Div.

FILLINGS
Bahr Bros. Mfg. Co.
John W. Bolton & Sons, Inc.
Ronningen-Petter Co.
Shartle Brothers Machine Co.

FILTER MEDIA
Hungerford & Terry, Inc.
Palmer Filter Equipt. Co.

FILTERS
Bird Machine Company
Holyoke Machine Co.
Hungerford & Terry, Inc.
Johnson Corp.
Moore & White Co.
Permutit Company
Ronningen-Petter Co.
J. O. Ross Engrg. Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Walworth Company

NOW Silence

plus 100% Water Removal

from water-sealed vacuum pump exhausts

This new Burgess-Manning "WSS" Water Separator Snubber answers your long standing need for an exhaust silencer designed to also effectively remove all water. The "WSS" is designed to accommodate water having a percentage of settlings and other impurities and can be cleaned conveniently. Water separating is accomplished centrifugally with air discharged at top and water at bottom of unit.

Ruggedly constructed of heavy gauge, pressed and rolled steel — welded throughout for maximum strength and minimum weight. Sizes 1¼" to 3½" inclusive are equipped with American Standard threaded connections — sizes 4" to 12" equipped with welded on flanges drilled to match 125 lb. American Standard. Can be furnished to meet unusual and corrosive conditions and in larger than 12" sizes, or for special applications.

For complete information, write for Bulletin No. 270.

BURGESS-MANNING COMPANY

735 East Park Avenue, Libertyville, Illinois

FILTERS, LIME MUD
Bird Machine Company

FILTER SCREENS
Ronningen-Petter Co.

FINE SCREENS
Bird Machine Company
Sandy Hill Iron & Brass Works

FITTINGS
The Bagley & Sewall Company
Crane Company
Grinnell Company
Pittsburgh Piping & Equipt. Co.
Shartle Brothers Machine Co.
Walworth Company

FLEXIBLE COUPLINGS
Dodge Manufacturing Corp.
Egan, Frank W., & Co.
Jeffrey Mfg. Co.
Shartle Brothers Machine Co.
John Waldron Corp.
Westinghouse Electric Corp.

FLOORING, GRATING AND TREADS
The Goodyear Tire & Rubber Company
Norton Co.

FLOTATION EQUIPMENT
Ronningen-Petter Co.
Walker Process Equipment, Inc.

FLOW BOXES
Lukens Steel Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

FLUID FILTERS
Ronningen-Petter Co.

FOLDERS
Emerson Mfg. Co.
Hudson Sharp Machine Co.

FORMATION TESTERS
Testing Machines, Inc.
Williams Apparatus Co.

FOURDRINIERS
Beloit Iron Works
Black Clawson Company
Downingtown Mfg. Co.
Manchester Machine Co.
Moore & White Co.
Ross Paper Machinery Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

FREENESS TESTERS
Testing Machines, Inc.
Williams Apparatus Co.

GASKETS
B. F. Goodrich Co.
The Goodyear Tire & Rubber Company

GEAR MOTORS
Allis Chalmers Mfg. Co.
Elliott Company, Inc.
Westinghouse Electric Corp.

GEAR REDUCERS
Dodge Mfg. Corp.
Downingtown Mfg. Co.

GEAR REDUCER DRIVES
Link Belt Co.

GEARS
The Bagley & Sewall Company
Black Clawson Company
Downingtown Mfg. Co.
Frank W. Egan & Co.
Farrel-Birmingham Co.
E. D. Jones & Sons Co.
Moore & White Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.
Westinghouse Electric Corp.

GRAPHIC MACHINERY
Dilts Machine Works
Hudson Sharp Mch. Co.
Lyddon & Co.
Parsons & Whittemore
Potdevin Machine Co.

GRAPPLES
Blaw-Knox Company
Owen Bucket Co.
Wellman Engrg. Co.

GRATINGS
Blaw-Knox Co.

GRINDERS
Carthage Machine Co.
Farrel-Birmingham Co.
Gibbs-Brower Company, Inc.
Lobdell United Co.
Norton Company
Ross Paper Machinery Co.
The Sandy Hill Iron & Brass Works

GRINDING WHEELS
Norton Company
Simonds Abrasive Co.

GUIDES
The Bagley & Sewall Company
Beloit Iron Works
Black-Clawson Co.
Downingtown Mfg. Co.
Egan, Frank W., & Co.
Gilbert & Nash Co.
Moore & White Co.
Mount Hope Machinery Co.
Sandy Hill Iron & Brass Works
Waldron, John, Corp.

GUMMING MACHINES
Dilts Machine Works
Egan, Frank W., & Co.
Paper Converting Machine Co.
Potdevin Machine Co.
The Sandy Hill Iron & Brass Works
Waldron, John, Corp.

GUMS
Hercules Powder Co., Inc.
National Starch Products, Inc.

HEAT EXCHANGERS AND RECOVERY SYSTEMS
Mahon, R. C., Co.
Westinghouse Electric Corp.

HEATING, VENTILATING & AIR CONDITIONING
The Appleton Machine Co.
E. D. Jones & Sons Co.
General Electric Co.
D. J. Murray Mfg. Co.
Red-Ray Mfg. Co., Inc.
Ross Engineering Corp., J. O.
Valley Iron Works Co.
Westinghouse Electric Corp.

HONING KIT
John W. Bolton & Sons, Inc.

HOODS
Kalamazoo Sheet Metal Mfg. Co.

HOSE (Air, Water, Suction, etc.)
B. F. Goodrich Co.
The Goodyear Tire & Rubber Company

HUMECTANTS
Aktivin Division, Heyden Chemical Corp.
Arnold, Hoffman & Co., Inc.
Nopco Chemical Co.
Wyandotte Chemicals Corp., Michigan Alkali Div.

HYDRAULIC OSCILLATING SHOWERS
Ronningen-Petter Co.

HYDRAULIC TURBINES & ACCESSORIES
Allis Chalmers Mfg. Co.
James Leffel Co.

IMPREGNANTS
American Cyanamid Company, Industrial Chemicals Division
Sun Oil Company
B. F. Goodrich Chemical Co.

INDENTING MACHINES
Dilts Machine Works

INDUSTRIAL CONTROL
Allis Chalmers Mfg. Co.
Westinghouse Electric Corp.

INDUSTRIAL TIRES
B. F. Goodrich Co.

INDUSTRIAL TRACTORS
Allis Chalmers Mfg. Co.
Towmotor Corp.

INK (Flexographic)
Bensing Bros. & Deeney

INSTRUMENTS, TESTING AND MEASURING
Black-Clawson Co.
General Electric Co.
W. & L. E. Gurley
B. F. Perkins & Son
Taylor Instrument Cos.
Testing Machines, Inc.
Tracerlab, Inc.
Westinghouse Electric Corp.
Williams Apparatus Co.

INSULATION
Insul-Mastic Corp. of America

JACKETS
Emerson Mfg. Co.

JOINTS
The Bagley & Sewall Company
Beloit Iron Works
Downingtown Mfg. Co.
Johnson Corp.
Moore & White Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

JORDAN BARS
Ronningen-Petter Co.

JORDANS
Emerson Mfg. Co.
Ronningen-Petter Co.
Ross Paper Machinery Co.
Shartle Brothers Machine Co.

JORDAN FILLINGS
Appleton Machine Co.
Bahr Bros. Manufacturing Co.
John W. Bolton & Sons, Inc.
E. D. Jones & Sons Co.
Ronningen-Petter Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

KILNS
Allis Chalmers Mfg. Co.
F. L. Smidth & Co.

KNIVES
Black Clawson Company
John W. Bolton & Sons, Inc.
Dilts Machine Works, Inc.
Hamblet Machine Co.
E. D. Jones & Sons Co.
Moore & White Co.
Shartle Brothers Machine Co.
Simonds Saw & Steel Co.
Taylor Stiles & Co.
Valley Iron Works Co.

KNOTTERS
Black Clawson Company
Sandy Hill Iron & Brass Works

LABORATORY CORRUGATOR
Testing Machines, Inc.

LABORATORY DRIERS
Williams Apparatus Co.

LABORATORY EQUIPMENT
Appleton Machine Co.
Bauer Brothers Co.
Bird Machine Company
Cady & Co., E. J.
Dilts Machine Works
Downingtown Mfg. Co.
W. & L. E. Gurley
Egan, Frank W., & Co.
E. D. Jones & Sons Co.
Ronningen-Petter Co.
Shartle Brothers Machine Co.
Taylor Instrument Companies
Testing Machines, Inc.
Valley Iron Works Co.
Waldron, John, Corp.
Williams Apparatus Co.

LAMINATING MACHINES
The Bagley & Sewall Company
Dilts Machine Works
Egan, Frank W., & Co.
Hudson Sharp Machine Co.
Paper Converting Machine Co.
Potdevin Machine Co.
Ross Paper Machinery Co.
Waldron, John, Corp.

LAY BOYS
Dilts Machine Works
Gibbs-Brower Company, Inc.
Hamblet Machine Co.
Ross Paper Machinery Co.

LIME (Hydrated & Quick)
National Gypsum Co.

LINTER PULP
Hercules Powder Co., Inc.

LUBRICANTS
Cities Service Oil Co.
Gulf Oil Corp.
Houghton & Co.
Socony-Vacuum Oil Co.
The Texas Company

MACHINING
The R. C. Mahon Company

MAGAZINE REELS
Dilts Machine Works

MAGNETIC SEPARATORS
Bauer Bros. Co.
Emerson Mfg. Co.
Shartle Brothers Machine Co.

MATERIALS HANDLING
Dilts Machine Works
Downingtown Mfg. Co.
Jeffery Mfg. Co.
Link Belt Co.
Shartle Bros. Mch. Co.
Towmotor Corp.
The Wellman Engrg. Co.

MICROMETERS & CALIPERS
Cady & Co., E. J.
Farrel-Birmingham Co.
Lobdell Co.
Testing Machines, Inc.

MIXERS
Mixing Equipment Co.
Walker Process Equipment, Inc.

MICRO-CRYSTALLINE WAXES
Sun Oil Company

MOISTURE CONTENT CONTROL
Testing Machines, Inc.
Vapo Systems Co.
Williams Apparatus Co.

MOISTURE METERS
Testing Machines, Inc.

MOTORS
Allis Chalmers Mfg. Co.

MOTORS AND GENERATORS
Allis Chalmers Mfg. Co.
General Electric Company
Reliance Electric & Engrg. Co.
Westinghouse Electric Corp.

NICKEL AND NICKEL ALLOYS
The International Nickel Co.

PACKING BOXES
Johnson Corporation
Moore & White Co.
Shartle Brothers Machine Co.

PAPER CONDITIONERS
Vapo Systems Co.

PAPER MACHINE DRIVES
The Bagley & Sewall Company
Beloit Iron Works
Black-Clawson Co.
Downingtown Mfg. Co.
Manchester Machine Co.
Moore & White Co.
Sandy Hill Iron & Brass Works
Westinghouse Electric Corp.

PAPER MACHINES
The Bagley & Sewall Company
Beloit Iron Works
Black-Clawson Company
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Lukenweld
Manchester Machine Co.
Moore & White Co.
Pusey & Jones Corp.
J. J. Ross Company
Ross Paper Machinery Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.

PAPER MACHINE SLICES
Beloit Iron Works
Black-Clawson Company
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Valley Iron Works Co.

PAPER MILL MACHINERY
Ronningen-Petter Co.
Ross Paper Machinery Co.

PAPER TUBE MACHINERY
Dietz Machine Works
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Hudson Sharp Machine Co.
Langston Co., Samuel M.
Paper Converting Machine Co.
Ross Paper Machinery Co.

PARAFFINE WAXES
Sun Oil Company

PARAFFIN WAX EMULSIONS
American Cyanamid Co., Ind. Chem. Div.
Arnold, Hoffman & Co., Inc.
Hercules Powder Co., Inc.
Nopco Chemical Co.

PASTING MACHINES
Beloit Iron Works
Black-Clawson Company
Dilts Machine Works
Frank W. Egan & Co.
Gibbs-Brower Company, Inc.
Moore & White Co.
Murray, D. J., Mfg. Co.
Potdevin Machine Co.
Ross Paper Machinery Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron Corp., John

PEBBLE MILLS
Allis Chalmers Mfg. Co.
F. L. Smidth & Co.

pH METERS
Testing Machines, Inc.

PHOTO GRAVURE ROLLS
Stone, Thos. & Geo. M., Inc.

PIPE
Aluminum Co. of America
Armco Drainage & Metal Products, Inc.
Babcox & Wilcox Co.
Crane Company
Grinnell Company
National Tube Co.
Walworth Company

PIPE FABRICATORS
Pittsburgh Piping & Equipt. Co.
Ronningen-Petter Co.

PIPE FITTINGS
Aluminum Co. of America
Armco Drainage & Metal Products, Inc.
Crane Company
Grinnell Company
Pittsburgh Piping & Equipt. Co.
Walworth Co.

PIPING, HIGH PRESSURE
Pittsburgh Piping & Equipt. Co.

PIPING (Pilowold Lines)
Goodyear Tire & Rubber Co.

PITCH CONTROL
American Cyanamid Company, Industrial Chemicals Division
Antara Chemicals Division, General Dyestuffs Corp.
Monsanto Chemical Company
National Aluminate Corp.
Nopco Chemical Co.
Rohm & Haas Company

PLASTICIZERS
American Cyanamid Company, Industrial Chemicals Division
Aktivin Division, Heyden Chemical Corp.
Arnold, Hoffman & Co., Inc.
B. F. Goodrich Chemical Co.
Naugatuck Chemical Division of U. S. Rubber Co.
Nopco Chemical Co.
Rohm & Haas Company

PLATERS
Gibbs-Brower Company, Inc.
Perkins & Son, Inc., B. F.

PLATES
Armco Steel Corp.
Babcock & Wilcox Co.
Emerson Mfg. Co.
Lukenweld Division
Lukens Steel Company
I. O. Ross Engrg. Corp.
Timken Roller Bearing Co.

PLUGS
The Appleton Machine Co.
Black Clawson Company
Emerson Mfg. Co.
E. D. Jones & Sons Co.
Shartle Brothers Machine Co.

POPE TYPE REELS
Black-Clawson Company
Downingtown Mfg. Co.
Egan, Frank W., & Co.
Manchester Machine Co.
Ross Paper Machinery Co.
Sandy Hill Iron & Brass Works

PRESERVATIVES
Antara Chemicals Division, General Dyestuffs Corp.
E. I. du Pont de Nemours & Co.

PRESS ROLLS
Beloit Iron Works
Black-Clawson Co.
Cincinnati Rubber Co.
Downingtown Mfg. Co.
Goodrich, B. F., Company, Inc.
Manchester Machine Co.
Moore & White Co.
Ross Paper Machinery Co.
Sandy Hill Iron & Brass Works
Stowe-Woodward Inc.

PRESSURE FILTERS
Holyoke Machine Co.
Hungerford & Terry, Inc.
Ronningen-Petter Co.
Sandy Hill Iron & Brass Works

PRESSURE VESSELS
Chicago Bridge & Iron Co.
Mahon, R. C., Co.
A. O. Smith Corp.

PRESSES
Beloit Iron Works
Black-Clawson Company
Downingtown Mfg. Co.
Dietz Machine Works
Farrel-Birmingham Co.
Gibbs-Brower Company, Inc.
Hudson-Sharp Machine Co.
Manchester Machine Co.
Moore & White Co.
Paper Converting Machine Co.
Potdevin Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Testing Machines, Inc.
Valley Iron Works Co.
Waldron Corp., John
H. G. Weber & Co., Inc.
Williams Apparatus Co.

PRINTING ROLLS
Stone, Thos. & Geo. M., Inc.

PROTECTIVE COATINGS
Insul-Mastic Corp. of America

PULLEYS
Bird Machine Company
Black-Clawson Co.
Dodge Mfg. Corp.
Sandy Hill Iron & Brass Works

PULP CLASSIFIER
The Bauer Bros. Co.
Testing Machines, Inc.

PULP CLEANERS
Bauer Bros. Co.
Bird Machine Co.
Nichols Engrg. & Research Corp.
Sandy Hill Iron & Brass Works
Shartle Bros. Machine Co.

PULP REFINERS
Emerson Mfg. Co.
Shartle Bros. Machine Co.

PULP SCREENS
Bird Machine Co.
Murray, D. J., Mfg. Co.
Sandy Hill Iron & Brass Works
Shartle Bros. Machine Co.

PULP STOCK VALVES
Crane Company
Grinnell Company
Murray, D. J., Mfg. Co.
Record Fdy. & Mach. Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

PULPERS
Apmew, Inc.
Bauer Brothers Co.
Dilts Machine Works
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Ross-Midwest Fulton Corp.
Morden Machines Co.
Shartle Brothers Machine Co.

PULPS
Brown Company
Gottesman & Co., Inc.
Lyddon & Co. (America), Inc.
Parsons & Whittemore, Inc.
Perkins-Goodwin Co.
Price & Pierce, Ltd.
Pulp and Paper Trading Co.
Restigouche Co., Ltd.

PULPSTONES
Norton Company

PULP TESTERS
Testing Machines, Inc.
Williams Apparatus Co.

PULP WASHERS
Sandy Hill Iron & Brass Works
Shartle Bros. Machine Co.

PULVERIZING MILLS
Jeffery Mfg. Co.
F. L. Smidth & Co.

PUMP VALVE BALLS
Stowe-Woodward Inc.

PUMPS
Allis Chalmers Mfg. Co.
Apmew, Inc.
The Bagley & Sewall Company
Beloit Iron Works
Black Clawson Company
Buffalo Pumps, Inc.
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
Johnson Corp.
Moore & White Co.
Nash Engineering Co.
Read Standard Corp.
Ronningen-Petter Co.
Roots Connersville Blower Corp.
J. J. Ross Company
Ross Paper Machy. Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.

RADIANT BURNERS
Red-Ray Mfg. Co., Inc.

RAG COOKING PROCESSES
General Dyestuff Corp.
Rohm & Haas Company

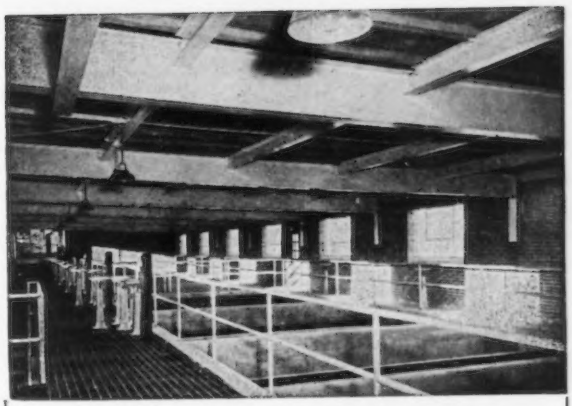
RAG CUTTERS
Gibbs-Brower Company, Inc.
B. F. Perkins & Son, Inc.
Taylor-Stiles & Co.

RECOVERY SYSTEMS
Babcock & Wilcox Co.
Chicago Bridge & Iron Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Pusy & Jones Corp.
Ross Engineering Corp., J. O.
Valley Iron Works Co.
Vulcan Copper & Supply Co.

REEL DRIVES
Horton Mfg. Co.

REELS
The Appleton Machine Co.
The Bagley & Sewall Company
Beloit Iron Works
Black Clawson Company
Dilts Machine Works (Kohler Systems)
Egan, Frank W., & Co.
Downingtown Mfg. Co.
Hudson-Sharp Mch. Co.
Manchester Machine Co.
Moore & White Co.
Ross Paper Machinery Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
The Smith & Winchester Mfg. Co.
Waldron, John, Corp.

REFINERS
Appleton Machine Co.
Bahr Brothers Mfg. Co.
Bauer Brothers Co.



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